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ABSTRACT

Designed to condense the material in a wide range of articles about computers and composition, this bibliographical review on computer use in composition is preceded by brief discussions of current pedagogical theory on composition instruction and of the directions in which computing in composition appear to be developing. The reviews contain material on composition instruction ranging from elementary school to advanced college composition courses, though the predominant focus is on the use of computers in the teaching of freshman composition. In addition, the reviews cover titles relating to evaluating courseware, computers and classroom management, computers and research databases, computers and reading, word processing in office systems, and the use of electronic mail in a variety of applications. (HOD)

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COMPUTERS AND COMPOSITION:

AN ANNOTATED BIBLIOGRAPHY

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CS 209 328

COMPUTERS AND COMPOSITION:
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Introduction

The following bibliographical review of articles on computer use in composition instruction was completed in May 1985. It grew out of the my interest in recent approaches to the teaching of composition as pressures to increase class sizes mounted, but as research into the theory of teaching composition also expanded. I was soon overwhelmed by the amount of material available on the subject of computers and composition. This wealth of information stands in sharp contrast to the relatively small body of published research just two years earlier, when Paula Nancarrow, Donald Ross and Lillian Bridwell surveyed the new field in what appears to be a fairly comprehensive single-volume annotated bibliography. Even the thought of such a volume today is out of the question, so great has been the recent growth of research and practice in computers associated with instruction in written composition.

As a result of the expansion of activity associated with computer use in composition instruction, there is a noticeable qualitative difference between the latest material published and that published earlier. I fear, therefore, that the reviews contained in the present study refer to a good deal of material that will soon be outdated. Nevertheless, even the quickly dated material is valuable, since it offers some background to the information that those of us who see the possibilities--or

perhaps the necessities--of combining computers with the teaching of composition should know.

The purpose of the following collection of reviews is to condense the material in a wide range of articles about computers and composition for those who would like to survey the field. The reviews themselves contain material on composition instruction ranging from elementary school to advanced college composition courses, though the predominant focus is on the use of computers in the teaching of freshman composition. In addition, the reviews include titles relating to evaluating courseware, to computers and classroom management, to computers and research databases, to computers and reading, to word processing in office systems, and to the use of electronic mail in a variety of applications.

This short introduction to the reviews included in the present study outlines some of the directions in which computing in composition appear to be developing. Prior to that discussion, however, this introduction reviews very briefly current pedagogical theory relating to the teaching of composition, for virtually everyone involved in teaching composition with the aid of computers affirms that the computer must fit the pedagogy, rather than the pedagogy fitting the computer. At the same time, of course, we cannot ignore the forces for change that computers will have in our teaching, once we start to use them.

Current Theory in Composition Pedagogy

Many of the articles reviewed in the present study mention terms such as cognitive process theory in composition, and high and low order cognitive skills. These terms often relate to models discussed in the work of writers like Karen I.Spear, Linda Flower and John R. Hayes, and Carl Bereiter and Marlene Scardamalia. Karen Spear's cognitive development theory posits that novice or poor writers concentrate on low order cognitive skills such as spelling, punctuation and correct usage; such writers are concerned with writing that contains no errors. Poor or novice writers often see good writing as necessarily defined by some authority whose individual rules must be followed. For Spear, a major feature of writers who focus on low order cognitive skills is the lack of relational concerns. Words are seen predominantly in isolation, as are punctuation and usage issues.

As students develop writing skills, in Spear's model, they begin finding relational concerns in their writing. In Spear's middle stage of development, rules of right and wrong are often vested in the social environment, not with only one authority. In this stage, writers see that perhaps different presumed authorities disagree about whether some detail is correct. Significantly though, writers at this stage have still not internalized the conventions of communication, so their compositional choices are what the writers consider to be valued by others.

In the third and highest stage of development, writers determine their content and expression on the basis of their own communicative aim. Matters of right and wrong are governed by the writers themselves, and correctness is determined relationally, not in isolation. At this stage of development, writers participate purposefully in a well-developed composing process.

Purposeful writing does not, however, mean that expert writers sit down to write a piece from beginning to end in one sitting. Expert or experienced writers, in the Flower and Hayes model (see Figure 1), work recursively, shifting from task to task, building a network of verbal relationships rather than an arrow of meaning. In preparing a piece of writing, an author goes through various stages--planning or pre-writing, drafting, revising, and proofreading--but the author does not often move from stage to stage linearly. Even in revising, the writer is still planning and drafting. Perhaps one could talk of a writer moving back and forth in recurrent cycles among the tasks of generating ideas, organizing ideas, planning content goals and subgoals, planning writing process goals and subgoals, drafting or translating mental concepts into physical writing, and revising. All the while the writer concerns him or herself with relating the text to already written text as well as to the writer's considerations of how the text is to affect a potential audience. The mental shifting between the various cognitive activities or subprocesses is controlled by what Flower and Hayes call a "monitor." Figure 1 below sketches out the Flower and

Hayes cognitive process model of composing.

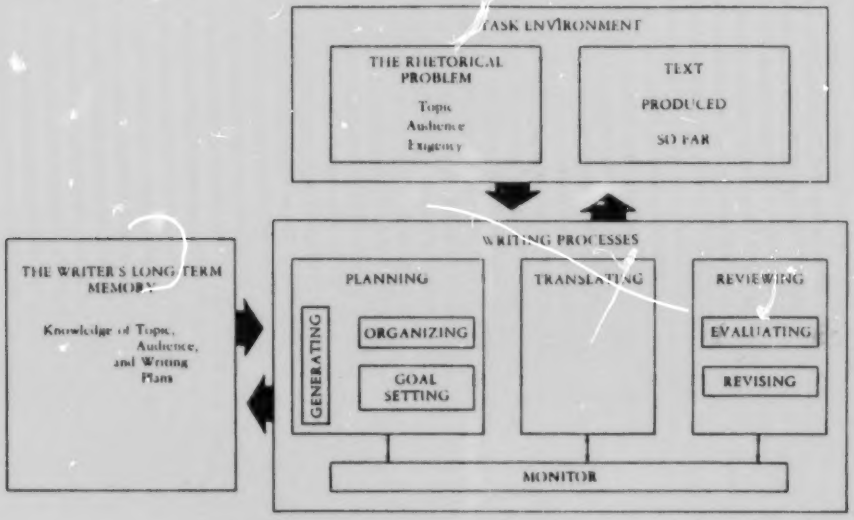

Figure 1. Structure of writing model (Flower and Hayes, 1981, 370)

Bereiter and Scardamalia, focusing on a school rather than a college level setting, stress the need for writers to master the lower level cognitive skills discussed above in order to avoid a cognitive overload in the process of writing. For instance, if writers spell poorly or if they are concerned about the intricacies of punctuation or of the passive voice, the translating phase of composition will take up so much energy that little is left for all the other subprocesses present in the Flower and Hayes model. Indeed, Sondra Perl's research strongly suggests that for poor college writers surface concerns can take on such importance that these low level cognitive matters prevent the writers from attending to matters of content.

A Review of Computer Applications in Composition Instruction

An understanding of the theoretical issues discussed above is crucial for both software authors and instructors using computers in composition classrooms. In creating effective software, one must attempt to relate the approach of the computer program to the natural functions of the user's mind in order for the user to be able to learn. Hence, the decisions the software author makes are governed by his or her mental models of how writers actually compose. Alderson points out that when the TICCIT program was being prepared in the mod-1970's, a noticeable frustration for organizers was the professional disagreement between the composition instructors acting as project consultants. Given the rapid changes in composition theory taking place at that time, this disagreement is not surprising. However, even in the programs of the last two years different pedagogical approaches are apparent. Researchers at the University of Pittsburgh are designing basic writers' programs that focus exclusively on the editing of surface errors (Hull), and the computer assisted program at the University of Minnesota-Duluth is based on a behaviorist approach (Bacig and Risdon). On the other hand, the pedagogical philosophy of most programs that stress the use of word processors for revision follow the composing theories of Flower and Hayes, emphasizing a focus on content rather than on surface form. Most courseware in this camp assumes the need for copious writing as a means of discovering relationships between ideas.

Even courseware that follows the "writing to discover" principle presents a great variety in approaches. Hugh Burns and Philip Gillis both stress invention, with Burns' INVENT series based on Aristotle's topoi, on Burke's dramatistic pentad, and on Young, Becker and Pike's particle-wave-field developmental pattern. Gillis also uses the approach of Young, Becker and Pike, but changes Burke's pentad to the journalistic W5 + How format, and he adds further heuristic patterns of his own devising.

For stylistic analysis, Bell Laboratories' "The Writer's Workbench" (Kiefer and Smith) seems to have set an industry standard, although IBM is presently developing a parallel program called "Epistle." Richard Lanham's "Homer" (Cohen and Lanham), though much more modest than "The Writer's Workbench," aims at the same problems, but since Lanham's courseware is much more modestly priced, and since it runs on Apple II hardware, it is much more accessible to small institutions than is "The Writer's Workbench," which requires a Unix or Vax mainframe. UCLA's WANDAH package also contains style checking programs, which are already finding their way into other colleges (Sadler and Greene), and the whole WANDAH program should by now be on the market, since Harcourt Brace Jovanovich originally planned for its release by the end of 1984 (Friedman). The following bibliographic reviews also reflect the individual work of instructors throughout the United States.

A number of interactive programs (programs that provide for some variety in response, depending on the input from the user)

are not as directed as those discussed above. Many in this less defined mode depend on "contentless" prompts, especially those focusing on the inventional stage of writing. For instance, programs especially at the elementary school level (Bradley) can respond to a single-sentence paragraph by asking, "Johnny, can you tell me more about _____?" At the college level, this can be altered to the form, "The normal number of words per paragraph for college freshman writing in the persuasive mode ranges from 75 to 175. This paragraph, Martha, contains only 33 words. Would you like to review the paragraph?" The only Canadian program I found for review fits this latter response pattern, though Earl Woodruff, working with Carl Bereiter and Marlene Scardamalia in Ontario, has the computer courseware develop content responses based on key words in the previous sentence.

Many computer assisted writing programs, of course, contain no specialized composition courseware. Word processing programs by themselves allow students and writing instructors far more freedom in drafting and revising than pencil and paper or typewriters ever could. Sadler and Greene, for instance, describe a program in which students hand in multiple drafts of their writing, with improvements resulting from peer consultation and conferences with instructors. Elizabeth Sommers also describes such a program, but she is especially interested in how the presence of word processing equipment combined with sound teaching alters the composing and instructional process. Fluegelman and Hewes, among others, suggest that the word processor alone will revolutionize writing practices, and their

book provides an excellent introduction into the practicalities of word processors, for those who have recently purchased their hardware or for those still contemplating a first purchase.

Research on how word processing affects writing students has already begun. Results from carefully monitored studies of classes using word processors compared with control classes without word processors should soon be available (Sommers). At the University of Minnesota, which began working with computers in 1981, Lillian Bridwell and Donald Ross have discovered a variety of student approaches to word processing. Students using visual clues--diagrams, "trees," spatial indicators--and students using chunks that must be connected find adaptation to the word processor slower than students who work from an initial global plan. However, recognizing the need for various approaches to writing, John and Catherine Smith at the University of North Carolina are developing a program that presents writers with a programmed inverted "tree," to allow writers to shape their plans spatially rather than in traditional outline form.

To probe the cognitive processes of writers using word processors, Carnegie-Mellon University is developing a program that will, first, shift freely from place to place in the already written text, and, second, trace the circumstances under which such shifts take place (Neuwirth). The description of the Carnegie-Mellon program reminds one of the monitor's activity in the Flower and Hayes cognitive process model of writing. Another interesting research project is that of Mark Haselkorn and Robert Connors, whose point of departure is also the Flower and Hayes

model. Haselkorn's and Connors' program blanks out sentences as soon as they are completed, forcing the user to retrieve formally specific sentences to review already written text. Since all such review is traced by keystroke, any reviews and revisions are documented, thus giving researchers a profile of the user's composing patterns.

A final area of research focuses on using the computer for grading student essays. As early 1965, Ellis Page suggested that computers could be programmed to pick up key surface features of writing in order to judge the quality of that writing (Malone). Philip Gillis has continued that research at Georgia State University, and he concludes that the correlation between results of the human raters and the machine evaluation in his studies was high enough "to justify the machine evaluation as a reliable measure" in the qualities he had predetermined. The approach of Page and Gillis is, of course, not from removed from stylistic review programs such as those found in "The Writer's Workbench," the difference for Gillis and Page being an evaluative rather than a diagnostic objective.

Lest we become too focused on composition though, some of these reviews remind us that the computer revolution is affecting language instruction in many ways. In one program not reviewed here, a voice-synthesizer is being used to give basic writers oral feedback on what they write. In another program, Alan Lesgold describes the use of word games as a means of enhancing the teaching of reading in elementary schools. Virginia Bradley mentions the use of electronic mail for deaf children and for

correspondence between distant schools (e.g., the lower states and Alaska). Halpern and Liggett's volume discusses changes in the workplace that should be having an impact on instruction in our classrooms. They focus on the prevalence and nature of composing specifically with dictaphone-word processing systems, suggesting that composition students should be better prepared for such a composing environment than they presently are. The computer is also being adapted to literature classes. Helen Schwartz's "Seen" program prompts students for responses on literary works discussed in class, then it lists all responses relating to specific works to allow students to share their insights. Cynthia Selfe's "Wordsworth II" program will also contain a literature module, though present details are still sketchy.

A final use of computers in the humanities generally (though not one reviewed in this study) is the accessing of commercial and educational data bases for research. A computerized search of two files, Research in Education and Current Index to Journals in Education provided a number of important articles for the present study. The presence of data files such as these indicate unequivocally that academic and professional bibliographic searches will necessarily come to rely more and more on computerized processes within the next few years.

Courseware Design

As mentioned above, virtually all the literature relating to computers and composition, from elementary school through college, insists that the computer is most effective as a teaching aid, not as a teacher. Wilcox makes the point that the computer and courseware can be compared to a textbook. Though a textbook is a valuable classroom resource, it does not take the place of a classroom instructor. Perhaps the TICCIT experiment (Time-shared, Interactive, Computer-controlled Interactive Television [see Alderson]) could be instructive in the question of whether the computer will replace the teacher in the near future. In 1972 the Educational Testing Service funded an experimental program at two American community colleges, in which carefully designed computer programs were to be fully self-contained in presenting freshman English and mathematics courses. In spite of all the care and effort that went into these programs, only 16% of the mathematics students completed the course in the time given. In the case of English composition, the designers deliberately integrated the computer component of the instruction with the classroom-based activity, since no means had been devised for the computer to teach essay writing. Under these circumstances the English completion rate came to over 50%. The program has been developed further, and is in use at Brigham Young University now (Pedersen), but it has been developed as an adjunct to the classroom, not as a replacement of the instructor.

The advent of self-contained microcomputing systems is rapidly changing the face of computing courseware in education. The TICCIT system was necessarily based on a central mainframe, as are the large present systems such as "The Writer's Workbench." However, microcomputers with hard disk storage now offer as much memory as many mainframe systems offered fifteen years ago, so powerful computer hardware independent of a large, centralized system is today accessible to many composition instructors. This has led to the debate, in the following reviews joined by Lance Wilcox and Alfred Bork, about who should be making classroom software. Again the model of the textbook arises, with Bork maintaining that just as no individual teachers can be expected to write, edit, and publish a textbook on their own, so no individual teachers can develop their own courseware. Wilcox responds by suggesting that though teachers don't normally write their own textbooks, they almost always supplement textbooks with their own exercises. In just the same way teachers can develop their own limited computerized classroom exercises.

The question of teacher-generated courseware leads to the further question of quality in courseware design. Here again advances have been rapid. Much early courseware was simply a transfer of worksheets to computer, most often in drill and practice format. The PLATO programs of the University of Illinois followed this general pattern. However, as a number of articles reviewed in this study show, the computer is capable of providing much better service than worksheet drill. As expertise

is developed, interactivity grows, with programs more and more providing specific response to writer input. Earl Woodruff's programs mentioned above are but one aspect of this interactivity. One of the earlier programs, RSVP, developed under the directorship of Kamala Anandam at Miami-Dade Community College (Kelly), provided instructors with a data base of responses to student essays: the instructor chose the appropriate responses, punched in the correct programming details, and let the computer send the student a personalized review of his or her essay, complete with exercises and references for further study. The programs of Gillis and Burns are more interactive than RSVP, and interactivity is certainly standard in most of the extensive programs. The standards set for good courseware today (Kuchinskas, Lathrop) demand that the potential of the computer be utilized by courseware manufacturers.

But what is the best courseware for teaching freshman composition? Elray Pedersen describes the TICCIT program at Brigham Young University as a "benchmark of current computer technology." Given the length of time the TICCIT program has now had to develop, one could expect it to be a sophisticated program indeed. However, TICCIT may be too hardware dependent to be versatile enough to fit many college and university programs. Another major influence on computers in composition in the next years will be UCLA's WANDAH, which is just now coming onto the market. Already other colleges are adapting its features to meet their needs (Sadler and Greene). And Bell Laboratories' "The Writer's Workbench" has been a dominant force in stylistic

analysis for about five years already. However, none of these programs, from the information used for these reviews, has incorporated the latest technical features such as light pens, mice, or extensive graphics capabilities into their programs. As Richard Collier and John and Catherine Smith note, may writers use visual stimuli rather than words to think. Just as flexibility is being incorporated into business software, therefore, it will surely find its way into educational software soon.

Including the latest technological advances and the most interactivity, however, does not necessarily lead to the best courseware. The best courseware will vary from situation to situation, depending on the teaching environment and objectives. Ann Lathrop notes that at the time she wrote her article (possibly in late 1983), approximately 8,000 programs were advertised for the educational market. That number has grown considerably since then. Thus the question of courseware evaluation is crucial, so a number of reviews suggest criteria (Kuchinskas, Lathrop, Venezky), with all agreeing that classroom testing is essential, for courseware must meet the needs of the course, of the teacher, and of a variety of students (including students who attempt deliberately to circumvent or crash the program), not to mention considerations of budget and hardware compatibility.

Future Developments

A number of writers have noted that the field of computing has not yet produced a Shakespeare or a Newton, but Terry Winograd points out that until the late 1970's computer access was limited. However, the distribution of microcomputers has brought the power and versatility of computers into the home, where children are now growing up with this technology. We can therefore expect even more major advances than we have seen so far when persons who have grown up with computers begin to have an impact on the industry.

Though the past is important, the future will not necessarily simply move ahead in the directions that have already been set. A number of studies in this review are concerned about the social consequences of advances in computer technology, but not only with the general dangers inherent in it (Collier). The most frequent concern mentioned is the concern for equality and equal opportunity. Bridwell and Ross, for instance, mention that even within the university setting, some programs lend themselves more to computing than other programs, but they stress that all should have access to this powerful instructional mode. Unequal access will inevitably lead to a computer elitism. It is therefore incumbent upon educational institutions interested in the welfare of their students to ensure that the potential of computers is addressed.

In composition studies specifically, these reviews show the advantages of computer assisted learning over traditional learning, especially in the ability of computerized courseware to

individualize the teaching process. The crucial factor is the applicability of the courseware to the learning situation. This factor, however, has implications relating to how composition is taught. As noted at the beginning of this introduction, in the 1970's the pedagogical approach assumed in the TICCIT program led to extended professional discussions. Dawn and Raymond Rodrigues mention, as well, that when they explain their programs about prewriting at teacher workshops, often the discussion about prewriting takes up as much time as the discussion about microcomputers. Many teachers have had little exposure to either.

Without a strong theoretical base, there may be serious dangers in the use of even excellent courseware. "The Writer's Workbench," for instance, can be used to teach style in a rhetorical mode, in which possible variations in diction are studied for their impact on the audience. On the other hand, the same program can be used anheuristically, as feared by John Thiesmeyer, in which case the computer program leads not to greater flexibility for the writer but to greater dependence. Thus Plato's concern about "knack" versus "art" raised more than two thousand years ago will be more relevant than it has ever been before, for the rhetorical "knack" in this case will relate more to the ability to manipulate machines than to compose a good "speech" without knowing why it is good.

In conclusion, it is fortunate that the computer movement in composition has coincided with a renewal of interest in the pedagogy of rhetoric and composition. And it appears that those

most interested in developing computer programs for composition are also those interested in research in writing. As William Wresch points out in the introduction to his collection, all of the creators of programs discussed in his volume have Ph. D.'s, either in English or in education. Perhaps we can be optimistic, therefore, and see the computer movement in composition as yet another force in the direction of a holistic rhetorical approach to the teaching of composition rather than a means of advancing the "knack" of writing by stressing nothing but the absence of surface error.

FOOTNOTES

1. I am indebted to Professor Andrea Lunsford of the University of British Columbia for providing me with much recent material.

2. Except for the authors listed in the "Works Cited", all the references in the introduction relate to works included in the reviews.

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ARTICLE REVIEWS

Alderson, Donald L. Evaluation of the TICCIT Computer-Assisted Instructional System in the Community College. 2 vols. Princeton: Educational Testing Service, September, 1978. 916 p. (ED 167 606; 167 607)

Under a National Science Foundation contract in 1972, the MITRE Corporation developed an educational package for a 128-terminal computer system called TICCIT (Time-shared, Interactive, Computer-Controlled Information Television) and tested it in freshman mathematics and English courses in two community colleges. Apart from minimal individualized instruction, the courses were to be fully self-contained, thus differing significantly from computer programs used as an adjunct to regular courses. The Educational Testing Service study, the focus of this report, compared the performances and attitudes of students in the experimental computerized setting with the performance and attitudes of students in lecture-discussion sections. In addition, the study examined the attitudes of administrators and instructors, both those involved in TICCIT instruction and those not involved.

The completion rate in the TICCIT math courses averaged 16%, vs. 50% for the lecture section completion rate; in English the completion rate was 55% for TICCIT courses, vs. 66% for the regular sections. Researchers attribute the low completion rate

primarily to the students' inability to manage their own instructional time. They also attribute part of the low completion rate to student diversity, a normal phenomenon in a community college setting.

In both mathematics and English, those students with an initial strong grasp of the subjects performed relatively well, both in completion rates and in posttests on content. Indeed, TICCIT students performed better by 5 - 10% than their relative counterparts in regular courses. The report suggests that students of low prior familiarity with a subject require greater instructional support than initially strong students. Given that the TICCIT courses, especially the mathematics program, was not set up to allow for increased individualized attention by instructors, the weak students either dropped out or did not finish the course within the initial time set. (A higher number of students than the 16% did, in fact, finish the courses, but took longer than one semester to complete.)

Student attitudes in this test of the TICCIT program were generally more negative than student attitudes in the regular program, primarily as a result of student perceptions that they were not getting as much individual instructor attention as their counterparts in lecture-discussion classes (though this perception was not borne out statistically). In only one English course, in which the TICCIT program was supported by small group discussions, as well as by weekly classes in which essays were assigned, were student attitudes more positive than the norm.

The author concludes that instructional assistance is therefore necessary in computer-based courses, so although a computer system may deliver the content of a full college course, thereby relieving instructors of some of their usual duties, the computerized course "generates new demands which preclude any dramatic increase in normal student-teacher ratios" (xxii). A further problem arose when personal instruction increased in order to combat the obvious attitude and attrition problems, for students then felt as if they were being taught by two instructors with different interests.

Faculty members in the colleges involved were unsure about the educational value of the TICCIT approach, both prior to the tests and after their experience with the programs. However, they cooperated fully with the program developers in both development and testing phases. Instructors involved in the program initially registered few fears that computer assisted instruction would take away instructor jobs, and they expressed no such concerns at all in posttests. However, those instructors involved with the program expressed greater doubts about the educational value of the program in completion surveys than they did in preliminary surveys. Administrators, however, tended to view the program more favorably than instructors throughout the experiment.

All the programs were designed with full teams of experts made up of an instructional psychologist, a subject matter expert (two college faculty members each from both involved colleges

were involved full-time in the courseware production), an instructional design technician, an authoring assistant, and a design technician. Developing the English programs led to "unexpected professional disputes," regarding optimal content and methods of presentation. However, the English composition courseware was eventually designed to include instruction in grammar, mechanics, diction, sentence structure and paragraph development, with the understanding that essays would be written within a classroom setting, thereby altering the original goal that the TICCIT courses were to be fully self-sufficient.

Alderson's report on the TICCIT experiment includes a brief discussion of the TICCIT program following the conclusion of this study by the ETS. In late 1976 the TICCIT program was sold to the Hazeltine Corporation, which has since expanded the system and begun commercial marketing. The two colleges involved have since incorporated the programs into their regular offerings, as has Brigham Young University, which was also involved in the original development. The author reports, without supporting data, that modifications to the programs have led to significant improvements in student attitudes, in classroom retention rates and to students' posttest results.

The present two-volume study is valuable as an analysis of how a complex program was planned and initially integrated into a community college system. However, probably as a result of the background of the researchers, it would appear that the conclusions tend to focus on the individualized, experimental

nature of the instructional mode generally, rather than on material unique to computerized instruction. The two English courses are not presented in much detail, and it would appear that the English programs focus more on drill and practice rather than on higher cognitive skills. The main textbooks for the courses are Baker and McCrimmon.

A more recent review of the TICCIT program at Brigham Young University is presented elsewhere in the present bibliography (Pedersen, q.v.)

Amarel, Marianne. "The Classroom: An Instructional Setting for Teachers, Students, and the Computer." Classroom Computers and Cognitive Science. New York: Academic Press, 1983, 15 - 29.

Amarel's article focuses primarily on the role of the teacher in public education, which is increasingly controlled from outside the classroom by subject specialists, district administrators, and publishers. This control conflicts with the growing need for classroom flexibility. Within this context the computer must first of all be integrated into the individual teacher's practices and values if it is to be used effectively.

Amarel's article has a theoretical base, especially in pedagogical concerns, but the issues of computer use are discussed from a pragmatic perspective.

Bacig, Thomas, Donald Larmouth, and Kenneth Risdon. "A Comprehensive Computer-Aided Program in Writing." Computers and Composition, Special Issue (April 1984), 1-22.

Bacig, Larmouth and Risdon review the present developments at the University of Minnesota-Duluth by presenting their theoretical assumptions related to composition pedagogy, and how computer-assisted instruction fits into it.

The writing program moves from the lecture/demonstration format to small-group interaction to individual instruction. Computer- aided instruction provides partial support at the individual level, enabling the instructors to supply a variety of exercises at different levels of difficulty. The CAI materials also track and record all student entries to allow the instructor to review the process as well as the product involved in each exercise.

The entire program, carefully sequenced, focuses on argumentation and comparison/contrast, thereby allowing the composition program to design highly targeted exercises, both written and computer- based. The authors stress that the formal structure of the underlying protocols for CAI materials has forced the course designers to specify each task closely, which itself has forced everyone involved to consider constantly the

structure and the logic of the composing process itself.

The description of the program presents a thoroughly planned and exhaustively considered approach to the teaching of writing. However, the authors confess that their approach has led to necessary compromises in writing styles and formats. From the review given, I am not sure whether the course strictures are set by the computer support or by other constraints such as traditionally printed support material or by some other administrative constraints. The course has been designed on self-confessed behaviorist principles, with complex tasks broken down into smaller components before the students proceed to "higher order" tasks. Again, the authors agree that recent theortical models question the behaviorist approach, but they know of no empirical evidence that supports that rejection.

Balkema, Sandra J. "Studying the Composing Activities of Experienced Computer Writers," Computers and Composition, Special Issue (April, 1984), 23-35.

Most studies of word processing and writing have focused on novice word processing users. Balkema, instead, has focused her research on four representative, experienced writers in a university research setting. Her study is in the process of being published. This article, however, reviews her procedures and offers a few conclusions.

Balkema's research attempts to answer how experienced users use the word processing system in their planning, in structuring their composing, in revising as they compose and after the draft is complete, how they prepare their text for transmittal, and how they access computer resources (databases or support programs).

She concludes tentatively that extensive traditional typing training is a disadvantage when learning to compose on a word processor. She also concludes that the users tended to use certain features of the system a great deal, but that experience did not necessarily lead to sophistication in the use of word processing systems. In Balkema's opinion, "for them to become sophisticated computer writers, they need guidance and training from writing instructors who understand the potential of word processing systems for the writing process" as well as the demands of the writing process.

Balkema's study, like others in this special issue of Computers and Composition, begins to look beyond the immediate concerns of the relationship between freshman composition and computing. It therefore points in one of the directions that research in the next few years will probably develop.

Bradley, Virginia N. "Improving Students' Writing With Microcomputers." Language Arts 59 (1982): 732-38.

Bradley reports on a number of uses for the microcomputer in elementary language arts programs, though some of her material is derived from college-level studies, especially material on invention. (She cites Burns [1979], Burns and Culp [1980], and Cronnell [1981].) She reports Woodruff and Scardamalia using sentence openers, contentless prompts and abstract element lists such as "give an opinion" and "give a reason" at the sixth grade level. However, two studies in the use of variations of this program revealed no noticeable improvement in quality with the use of microcomputers over normal classes, though the students responses were positive.

The article reports that the use of electronic mail for deaf students led to active letter writing for previously reluctant writers. Plans are also underway to link distant schools with an electronic mail system. The article also reports on wordprocessor use for composition by disabled students at East York School in Canada. Students who previously had refused to write became enthusiastic writers with the word processor.

Bradley also reports on a study of microcomputer use in the first grade. Generally students were enthusiastic, they wrote longer compositions they did in a traditional mode, and they found learning to use an Apple II computer relatively easy. Of three programs tested for first grade use, Bradley recommends

"Easy Writer" over "Apple Writer" and "Super Text," and she adds a list of desirable characteristics for elementary school word processors.

At the sixth grade level the "Apple Writer" and "Easy Writer" were found suitable for sentence combining exercises, learning either system taking less than an hour for sentence combining and composing.

This article approaches the topic in a grab bag fashion, though it is one of only a very few articles in the present study that has mentioned the use of computers in a Canadian language arts program.

Bork, Alfred. "Design Considerations." Computers in Composition Instruction. Eugene: International Council for Computers in Education, 1984. (ED 240 702) 53-58.

Bork asserts that courseware must be interactive, individualized and organizationally flexible. Bad practices in courseware design are often the result of a print medium mentality. He maintains, for instance, that since space on the screen is essentially free, spacing of material should emphasize the content, not traditional formats which try to squeeze words into lines, hyphenating if necessary. Screen layout should emphasize short lines following principles of easy readability.

He suggests, further, that scrolling speed for reading, and

response times in exercises should be controllable by the reader, that help sequences should be just as interactive as the rest of the program, and that, above all, the computer should be used as more than a workbook translated to the screen. Finally, he scores multiple choice responses and the use of symbols instead of common English words.

Bridwell, Lillian S., and Donald Ross. "Integrating Computers into a Writing Curriculum; or, Buying, Begging, and Building." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 107-119.

Bridwell and Ross had a theory-and research-based writing curriculum for freshmen and upper division courses at the University of Minnesota when they began work with computers in 1981. As they reviewed the field, they found a few good programs but narrow scope (Burns' invention [q.v.], Writer's Workbench [Kiefer, q.v.]), they found hardware incompatibility, little range for instructional inventiveness in the classroom, and very little research on the effects of word processing on the composing process. All of this led to a study into the potential for computers for upper division college writers, as well as to some specific software development.

With both graduate and upper division students using

computers on an allowance of two hours weekly, the researchers found a variety of approaches to word processing in their first year of analysis. Students using visual clues--diagrams, "trees," spatial indicators--and students using chunks that had to be connected found adaptation to the word processor slower than students who worked from an initial global plan. Further, through trial and error, the researchers found that introducing whole classes to word processing labs is best done with specific instruction geared to assignments. They found commercial programs relatively intrusive for students learning to focus on the writing process, so they have formulated a variety of approaches, reflecting the instructors' own preferences, but in the mix offering the students a variety as well.

In examining potential aids for students, Bridwell and Rose review access to information programs, text analysis modules and aids in the writing process. The first two are available commercially, though specific information programs can be created for writing courses (Marling, q.v.). Aids for the writing process though must be created by composition instructors, some of whom have done this. Bridwell and Donald here indicate their own interest in writing interactive programs focusing on audience analysis and writer persona development. In addition they see opportunities for creating interactive programs dealing with formats in various writing areas, including essays and various scientific reports. They also speculate on creating programs using split screens, with one side for composing and the other

side for such items as composition heuristics and composition theory, called up at the writer's need. Additionally, they see the need for word processing programs integrating light pens, graphics, and other visual aids to help the student. They envision a program that would allow students to embed comments to themselves, with a "strip" routine automatically deleting such material appropriately.

Bridwell and Donald are grappling with the problems of a large, public institution which cannot provide adequate computer access to all who desire it, as well as problems of creating computer flexible user-generated support for instructors who have neither the time nor the desire to become programmers. Without a strong effort at equal opportunity for all, the authors perceive a danger for select groups such as computer science and engineering students to become computer literate while others are ignored.

Burns, Hugh. "Recollections of First-Generation Computer-Assisted Prewriting." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 15-23.

Burns' INVENT series includes three prewriting programs based on traditional inventional heuristics: "Topoi", based on Aristotle's twenty-eight topics, for persuasive writing; "Burke,"

based on Kenneth Burke's dramatistic pentad, for informational or journalistic writing; and "Tagi," based on the work of Young, Becker and Pike, for informational or exploratory writing. The programs ask a student to enter a topic, to which the program then responds with a general, leading question, thereby establishing an open-ended brainstorming situation as input and response continue. Initial computer responses are randomly chosen from a list of ten possibilities.

The program is also able to respond to phrases or questions such as "I don't know," "What?" or "How?" with appropriate responses such as "Why not . . .?," tailoring the response to words in the student's initial input. Burns gives an example of this computer heuristic leading to fourteen pages of brainstormed information.

In future programs, whether by him or by other "second generation" programmers, Burns foresees improvements in the rhetorical connections between student and program, improved accounting for content and audience, improved instructions and elaborations, and a variety of responses including color, graphics, and sound. The prerequisites for these improvements reside primarily in the creative talents of the educators developing the programs rather than in the hardware capability.

Caldwell, Robert M. "The Acquisition of Language Skills Using Computer Based Instruction." Paper. Symposium on Cognition and Written Language, Conference on English Education Annual Meeting, Pittsburgh, March 15, 1979. 8 p. (ED 178 918)

Caldwell argues that computer based learning systems can fulfill the following conditions that contribute to verbal learning: the system is individualized, responsive and adaptive; individual curricula can be modularized in coherent, hierarchical patterns; performance objectives can be carefully articulated; mastery learning can be used as the basis of advance; and diagnosis and prescription can be easily utilized. Caldwell cites research showing that computer assisted instruction programs "yield increases in achievement and positive changes in attitude toward learning as well as consistent reductions in the time students require to achieve determined objectives." Hence he sees the possiblity of computer technology providing the "critical conditions of verbal learning for all children regardless of their socioeconomic status or level of language development."

Cohen, Michael E., and Richard A. Lanham. "HOMER: Teaching Style with a Microcomputer." The Computer in Composition Instruction: A Writer's Tool. Urbana: National Council of Teachers of English, 1984. 83 - 90.

The HOMER computing program complements Richard Lanham's textbook entitled Revising Prose (1979); both are available from Scribners. The package aims to help writers avoid an official style by focusing writers' attentions on a heavy use of prepositional phrases, passive verbs, noun phrases based on nominalizations, and long sentences with vague (woolly) words. After students enter their draft papers into the computer, the program presents the texture of the copy visually, with a new line beginning at every preposition, or with sentence lengths presented as bar graphs. In addition, the features mentioned are statistically summarized, with informal comments highlighting the problems to help the student become aware of his writing style in order to find areas for improvement.

This program, much more modest than Bell Laboratory's THE WRITER'S WORKBENCH, focuses on the same problems as its larger cousin. However, because HOMER is available for use on an Apple computer and is marketed by Scribner's, it is much more accessible, both practically and financially, than THE WRITER'S WORKBENCH. For a school with Apple II computers it might serve as a valuable teacher aid in focusing on writing style.

Collier, Richard M. "Writing and the Word Processor: How Wary of the Gift-Giver Should We Be?" Computers and Composition, Special Issue (April 1984), 67-93.

Richard Collier acts as both advocate and devil's advocate for the use of word processing in composition classes. He opens with reference to Wylie Sypher's four stages of art, applying those stages to composition studies and computers. Phase I includes discovery of new materials, Phase II reflection about these discoveries, Phase III the combination of new material and theory, and Phase IV the extended codification of what has happened. Collier sees composition studies as well as the combination of composition and word processing now in the reflective Phase II, with composition in isolation more advanced. Collier then reviews his own experience with students and word processing, suggesting that the average quality of his students' work improves when they use computer programs, the work is more fun, and the writers gain confidence in their own achievement. Word processors encourage playing with words, which is especially attractive in creative writing classes. However, Collier admits that the new technology is not suited to everyone's composing patterns.

In the last section of his paper, Collier suggests possible disadvantages to the students' use of word processors. He

mentions that instructor enthusiasm cannot be transferred to students automatically--that many students, in fact, become extremely anxious when faced with a keyboard and a CRT. Further, those students who enjoy working at a terminal may lose the ability to work creatively with paper and pencil, just as many math students have forgotten how to multiply and divide without a pocket calculator. In addition, the computer may distance students from their writing, first because the drafted product is produced more linearly on the screen than on a page, and secondly, because the physical feel of pen and paper and of the curvilinear movement of the fingers is replaced by the hardness of computer paraphenalia. Finally, Collier points to potential social inequities as the privileged will be able to learn with the aid of their compact hardware whereas others will be left with pencil and paper.

Collier's article is largely interesting musing based on his readings of authors like Sypher and McLuhan, combined with his reading of recent theoretical literature on composition. His first approach presents an interesting historical model which could guide research to some extent; his second approach presents the kinds of cautions that are often ignored during the exciting rush for new discoveries.

Cronnell, Bruce, and Ann Humes. "Using Microcomputers for Composition Instruction." Paper. Conference on College Composition and Communication. Dallas, 1981. 10p. (ED 203 872)

Cronnell and Humes suggest that students don't revise much, probably because it's a lot of work. But the wordprocessor simplifies the task. This brings the computer beyond using it for drill and practice, or using it as a complex programmed text or as a mechanical workbook. Using a wordprocessor, students can revise a prewritten text or produce their own text. The wordprocessor can suggest corrections, such as combining short sentences with the same noun or noun phrase, combining short paragraphs, or correcting spelling and usage errors. The teacher can also act as editor, suggesting various revisions.

The authors, calling themselves novices, mention the difficulty in writing programs for natural language use, but suggest that sentence combining is an appropriate place to begin, since using sentence combining to increase writing fluency is based on solid research, since it is straightforward, and thus a good beginning exercise for novice computer users, and since programming sentence combining exercises, though complicated, is simpler than programming for some other uses that they review. Using the wordprocessor for revision of arrangement is also stressed.

Daigon, Arthur. "Evaluation of Student Composition by Computer." Paper, Annual Mid-Winter Meeting of the School and College Conference on English, 1967. (ED 117 708)

Daigon's address, theoretical in nature, stresses the objectivity of computer grading as well as the computer's tirelessness in dealing with "counting" tasks. The presentation focuses on using the computer to identify readability and style based on sentence and word length, as well as for low cognitive level features such as spelling, grammar and usage errors. Interestingly, the author's approach is to supply the computer with dictionaries of misspellings and common faulty usage patterns rather than with correct spellings and standard usage patterns. His focus is therefore clearly related to the needs of the computer rather than to the needs of the composition student. However, Daigon does envision "having the computer learn language as a baby learns," "by ingesting great masses of language," thereby assimilating a data base from which grammatical and syntactical rules can be derived inductively.

This relatively early presentation of computer applications to English composition is highly optimistic, but much of Daigon's approach is presently implemented in programs such as Bell Laboratories' "The Writer's Workbench" (Kiefer, q.v.).

Day, John T. "Writing and Computers: the St. Olaf Experience." Computers and Composition: Special Issue (April 1984), 95 - 111.

St. Olaf College, Northfield Minnesota, is a four-year liberal arts college with 3,000 students and 225 faculty members. St. Olaf's policy regarding computer use states that "all the computer resources of academic computing at St. Olaf College are available to any student or faculty member without special permission, or cost. . . for any personal or academic purpose." In 1983, perhaps one student in twenty submitted a paper prepared on a computer; in 1984 all of the author's students were given computer training.

Day's article deacribes the use of text editing in his composition classes. The article contains the testimonial of a basic writer who became a good writer after learning to compose on a computer. The students states that he and many of his friends use the computer for writing "because it works."

Day stresses the ease of invention and revision with a word processing system. First, students write copiously, and, secondly, they find revision neat and easy. They also find the use of THE WRITER'S WORKBENCH relatively easy and helpful. Day asserts that the assumptions about writing that have gone into the Writer's Workbench are generally shared by the St. Olaf's faculty, though various groups of students are also instructed on how to interpret the stylistic data from THE WRITER'S WORKBENCH.

St. Olaf's College appears exceptional in its willingness to support students and faculty with general computer services. Rather than focusing on creating special software, as is the case in many colleges, St. Olaf's instructs students in adapting what is commercially available. This approach does not require a great number of computer programming specialists while still offering the students the advantages of training in both writing and in general computer use.

Fluegelman, Andrew, and Jeremy Joan Hewes. Writing in the Computer Age: Word Processing Skills and Style for Every Writer. Garden City, New York: Anchor Press, 1983.

Fluegelman and Hewes write, "This book is about writing, for writers." That description is accurate. This book describes and evaluates word processing generally as well as describing specific features of word processing from a professional writer's perspective. As such, the book is an excellent introduction to computers and word processing for someone contemplating the purchase of a word processing package as well as for someone relatively new to word processing hardware and software. I have used an IBM PCJr computer with a commercial word processing program for just over six months, and I found that the advice in this book applied to my situation well, even though neither my specific hardware nor my word processing program was mentioned.

The book has two main sections. The first deals with word processing basics such as learning to manipulate the word processor's controls and setting up productive routines to allow the user all the benefits of word processing. The second section presents practical writing techniques available to writers using word processing. For instance, the authors deal with various techniques to overcome "writer's block" or plain slogging writing. They suggest how the word processor's revising and text manipulation features can offer advantages unknown to users of typewriters and pens. In addition, they offer insights into useful combinations of pen and word processor.

The main feature of the book is its practicality. For example, over and over the authors point out the need to save text frequently, and to make back-up copies to avoid losing material as a result of electronic malfunction or human error. They describe in some detail various means of filing information, depending on the type of program one is using. And in a very worthwhile appendix they discuss the purchase of a word processing system. Contrary to the general rule, they assert that a writer should first consider hardware, and then buy software compatible with the writer's needs and the hardware's flexibility.

Writing in the Computer Age does not require an extensive background of the reader, though the more experience in either computing or writing the reader has, the more relevant will be the material. The authors themselves suggest that much of their

advice will not be valued until the computer-using writer has made his or her own errors. However, the preview of the field that Fluegelman and Hewes offer alerts readers to the worst dangers awaiting the busy writer, and it offers means of coping with problems that inevitably arise for every user of word processors.

Friedman, Morton P. "WANDAH--A Computerized Writer's Aid." Computers and Composition, Special Issue (April 1984), 113 - 123.

The WANDAH system, the physical details of which are described in the Von Blum entry (q.v.), uses three theoretical bases: the Flower and Hayes cognitive model of the writing process, the heuristics and teaching methods of modern composition pedagogy, and the Card, Moran and Newell Human Factors research on human-computer interfaces.

Friedman allows that no fair evaluation of WANDAH can yet (or perhaps ever) be made. Friedman maintains that the method of instruction, not the medium affects learning. Hence how WANDAH is used is more important than that WANDAH is used. Rather than focusing on comparisons between WANDAH and other approaches to composition pedagogy, therefore, Friedman wishes to concentrate on learning how WANDAH can be improved. He sees the true promise of this system in becoming a SUPER-WANDAH that would allow its

users a quantum leap in amplifying their problem-solving skills.

Friedman's article does not clearly define the scope of its author's thoughts. When Friedman talks of "problem-solving skill," for instance, does he refer to problem-solving in composition or to problem-solving generally? This is a specially vexing problem because Flower and Haye's cognitive skills model of composing, to which Friedman refers, is derived from a general problem-solving model in psychology.

WANDAH is to be published in a commercial version by Harcourt Brace Jovanovich, Electron Publishing, 1250 6th Ave., San Diego California, 92101.

Gerrard, Lisa. "From Wylbur to WANDAH: Designing Software for Student Writers." Computers and Composition, Special Issue (April 1984), 125 - 137.

In this article, Gerrard recounts her experiences with Wylbur, a text editor designed for computer programmers, so it was rather unsuitable for use in composition classes whose students had no computer experience. In 1981, when the author began her use of computers for composition, her students had to share, with all of UCLA, 49 terminals in a mainframe time-sharing system. Students often had to wait up to two hours for a terminal.

In the first three years of Gerrard's use of Wylbur, she

states that her incoming freshmen showed no increase in computer literacy. Of the 200 or so students that used Wylbur, only about five or six were truly knowledgable about computers. Wylbur's demands did not make things easier. First, being a programming tool, Wylbur numbered each line on the screen, and each sentence had to begin on a new line. To copy, move, delete, or insert text, the user gave commands referring to line numbers rather than to words or sentences. Formatting proceeded separately from editing and required a string of programming commands unrelated to normal composing.

Nevertheless, Gerrard's experience with Wylbur taught her a great deal about designing courseware suitable to student needs. As a result, her article gives a number of recommendations that have been incorporated into WANDAH (q.v. Von Blum), the new UCLA comprehensive computer-aided composing system, for whose development Gerrard used her experience with Wylbur in her capacity as design consultant.

Gerrard's article presents the contrasts between Wylbur and WANDAH, the old and the new. The article, therefore, highlights the changes that have taken place within half a decade at UCLA, changes which reflect developments within the field of computing and composing generally.

Gillis, Philip Daryl. "The Utilization of Computer Technology as a Means of Teaching and Evaluating Prewriting Processes." Diss. Georgia State U.

As a result of the research described in this Ph. D. (Education) dissertation, the author concludes that Computer-Enhanced Learning (according to Gillis, the term CEL has replaced CAI) "is as good a means of prewriting instruction as a human tutorial method and is better than classroom instruction. Gillis cautions, however, that CEL methodology is compatible only with certain stages of the composing process. He suggests that "style and syntax in the composing process may not be reliably instructed or examined through computer technology for many years to come" (139).

The dissertation includes a useful review of relevant theoretical and practical literature in both composition pedagogy and computer-enhanced learning in composition. For this study, Gillis incorporated into his programs the inventional heuristics based on Kenneth Pike's particle-wave-field approach as well as the who-what-when-where-why-how of journalism. In addition, the programs reviewed the students' input with four more inventional strategies: a) list, analyze and associate; b) sensory associations; c) tests for specificity; and d) diagramming, charting or mental imagery.

Being a specialist both in computer programming and composition pedagogy, Gillis composed the programs himself. In

addition, Gillis composed programs to evaluate the following aspects of his student compositions: a quantitative measure of fluency, a qualitative measure of focus, a qualitative measure of intellectual processing as indicated by the linguistic clues of contrast, classification, change, and sequence. Gillis compared the results of the computer evaluations in these categories with the evaluations of human raters examining the papers for evidence of inquiry, comprehensiveness, appropriateness of arrangement and for an "holistic" impression, and concluded that the correlation between results of the human raters and the machine evaluation was high enough "to justify the machine evaluation as a reliable measure" (137).

Gillis' study used three different sections of Georgia State University writing students with substandard SAT and BSE scores, one section taught in the traditional method, one taught by a tutor familiar with Gentner's research, and one section taught by the computer enhanced method. Both pretest and posttest were based on topics on which previous classes had written essays, which were scored by human raters as well as analyzed for computer data relating to fluency, linguistic cues of focus, linguistic cues of contrast, classification, change, and for linguistic cues of sequence. This data was used as a basis, first, for providing response input for CEL lab participants in preparation for the posttest, and, secondly, for evaluating the posttests themselves. The pretest was written on the third day of the class and the possatest on the eighth day.

Gillis' study could be compared to the study of Burns and Culp in 1980 (q.v. Burns), since both studies focused on prewriting. However, Gillis programs resemble the human tutorial method more closely than the earlier study since Gillis' program included content data which was provided to the student writer. Hence Gillis' justification for comparing the CEL program to the tutorial setting as well as to the traditional classroom setting.

Gillis' approach capitalizes on his own expertise in both composition and computing. This expertise also leads to an interesting introduction, which discusses past as well as future involvement of the computer in composition instruction. Gillis is aware of the computer's limitations as well as its strengths. In this study, for instance, the computer is used to teach and reinforce inventional heuristics, but the data base is very narrow--the students must write essays on topics for which the computer has a data base. Over time, of course, numerous data bases could be developed on the model presented here. Secondly, Gillis" study uses the computer selectively, in this case for a single student assignment. Hence the instructional mode capitalizes on the novelty factor--a factor missing in the control group.

Gillis cites sources projecting a twenty-fold increase in educational uses of computers between 1980 and 1985. "The low cost of the microcomputer, coupled with its great versatility," he asserts, "is changing the entire field of CAI and the way educators think about the potential uses of computer technology

in education." By the end of the century some suggest that computers may have replaced books as the major delivery device in education. Gillis also mentions the economic advantages of computers in education, but the narrow scope of this study does not suggest that human instruction will soon become obsolete. As yet the computer can enhance human delivery, not replace it.

Halpern, Jeanne W. and Sarah Liggett. Computers and Composing: How the New Technologies are Changing Writing. rbondalele: Southern Illinois UP, 1984.

Halpern's and Liggett's monograph is one of the Studies in Writing and Rhetoric series sponsored by the Conference on College Composition and Communication. The title of this volume might be a bit misleading to a reader who equates "composition" with freshman composition and rhetoric, however, since the composing focused on Halpern and Liggett's study relates primarily to composing by dictation. The word processing, therefore, is not the writer composing at a wordprocessor but the secretary transcribing the dictated tape.

The authors' central point is that the future work settings for writing that college graduates are going to be involved in are changing. The modern office setting is part of an electronic environment that surrounds us with electronic mail in the form of telephones and telephone answering systems, word processors with

modems for telephone links, and dictation equipment used in conjunction with word processing transcription. Given the extensive use of dictation equipment, much of the composing by business persons is not written but oral--or a combination of written and oral, since many users of dictation equipment write rough plans before composing on tape.

In their study, Halpern and Liggett conducted twenty-eight structured interviews with users, managers, and operators of dictation-word processing systems in business, industry, government and the professions. They found problems in addressing dual audiences (the secretary and the primary audience), planning, coordinating the use of long and short-term memory, using both oral and written delivery skills, and collaborating with persons and equipment throughout the composing process.

Halpern and Liggett suggest that the problems they have identified are relevant to university composition classes, both for instruction and further research.

Haselkorn, Mark, and Robert J. Connors. "Computer Analysis of the Composing Process." Computers and Composition. Special Issue (April 1984), 139 - 158.

This article describes RECOMP, a system developed to gather data on how writers interact with previously written text as they

compose new text. A program designed strictly for research, RECOMP drops each sentence from the screen as the sentence is completed, forcing the writer to retrieve the sentence by means of function keys. The system records the patterns of writing, reviewing, and editing, thereby providing an analytical printout at the end of the session.

Though the process initially appears highly disruptive, Haselkorn and Connors assert that after about one hour writers are able to cope with the system well enough to concentrate on their writing. In exchange for the initial disruptiveness, the program provides rearchers with statistical data that would take hundreds of hours of traditional analysis to produce. The five types of output include 1) statistical data on each sentence, 2) cumulative data on time spent in various activities, 3) occurrences of various activities, 4) a timed tracing of the entire session, and 5) a final text.

Haselkorn's and Connor's article does not discuss the results of the study, which had not yet been completed at the time of writing. Instead, the article focuses on the theory behind the research. The authors' point of departure is the Flower and Hayes cognitive process model of composing, with the keystroke analysis supplementing the verbal and videotaped protocol analyses like those of Flower and Hayes. Specifically, the analysis focuses on the "Translating" and "Reviewing" stages of the Flower and Hayes composing model, that part of the writing process in which thoughts are "translated" into words or in which

mental reviews and revisions are instantiated into physical changes.

Because of the ease with which hitherto unaccessible data is made available, large numbers of writers at all skill levels and under various writing constraints can be studied to determine various composing and revising patterns. Preliminary results are expected in 1985.

If the authors are correct in their assertions that the writing process of their experimental method is less disruptive than it at first appears, that is, if the data are reliable, RECOMP should indeed provide the researchers with profiles of patterns in written composition in a quantifiable form that no non-computerized protocol would ever be able to duplicate. The results should therefore be of value both to researchers in composition pedagogy and to cognitive psychologists.

Holdstein, Deborah H. "Perception and Evaluation of Computers and Writing: Myths and Methods." Computers and Composition, Special Issue (April 1984), 175 - 184.

As an introduction to her article, Holdstein questions the narrowing of focus in recent composition and computing literatuare to only two interests: the search for one "beat" courseware program, and an exclusive focus on courseware relating to invention and word processing. Instead, Holdstein insists,

instructors must rely on their own educated, creative use of various kinds of software that covers the whole writing process. Courseware is no different from textbooks in the need for variety in the classroom.

Holdstein's article then reviews present methods of evaluating courseware. First, some question the ability of researchers to evaluate reliably at all, given the variables that need to be measured. Secondly, some value only quantitatively-oriented work. Thirdly, some focus on ethnographically-based, observational methods of research. Finally, some combine the quantitative with the observational.

In the second part of her article, Holdstein reviews a small research project in which she compared the traditional means of teaching comma use with a computer-based pedagogical method. Her results showed the computer-assisted group having better post-test results than the traditional group, but, more importantly, her observation revealed that the necessity of students sharing computer terminals in doing the comma exercises led to later classroom collaboration in writing--something that did not happen in the textbook-oriented class.

Holdstein emphasizes the the computer can be used for focusing on both surface skills and integrating and relating skills. But, more than that, Holdstein emphasizes the need for sensitive, educated instruction, which itself suggests that, though the computer is a valuable tool, it cannot be used effectively in the classroom without sensitive human

intervention.

Holdstein's concerns for sensitive, educated instruction is certainly timely. Her point that the computer cannot do what teachers can do to adapt instruction to student needs is made by many others. She also stresses the value of focusing on individual surface skills as well as on integrating and relating skills.

Hull, Glynda. "The Use of Microcomputers in Basic Writing." Computers and Composition, Special Issue (April 1984), 585 - 193.

Researchers at the University of Pittsburgh are designing computer software to teach basic writing students to correct their own mistakes, that is, to edit their own papers. The programs are not traditional revision programs but are aimed specifically at correcting surface errors in grammar and usage. The programs are to chart student errors by category, thus focusing on various "levels" of error, clustering errors by type, and recording student work for research purposes.

To create these programs, an interdisciplinary group composed of cognitive psychologists, composition teachers, computer scientists, and linguists is focusing on three areas: building a Basic Writer's Workbench that focuses on common errors of basic writers; building a parser to distinguish between

well-formed and ill-formed syntax patterns common to basic writing; building an editing program to detect particular contextual errors such as homophone confusions.

Hull points out that the goal of the program is to help students find and correct their own errors, rather than having teachers find student errors. Research has shown that, by itself, copious teacher marking has little value in helping students learn to write. Further, Hull suggests that self-correction of actual errors is a better teaching method than preventing errors before they appear in student writing. For the task of teaching students the special kind of reading necessary for self-editing, Hull holds that machines provide the objectivity and patience that few teachers can match.

The pedagogical focus for this program differs considerably from the writing for discovery focus standard in many freshman composition classes. It also differs from an approach for basic writers that begins building from basics, much as an ESL course might (e.g. Southwell, q.v.). Some theorists might, therefore, find fault with the surface error orientation of the Pittsburgh approach, but many classroom instructors cannot avoid it. Though basic writing has been the subject of a great deal of research in the last decade, much still remains to be learned.

Jordan, Pauline, Gary Michael, Mary Sliger, and James Williamson. Community College English Lesson Index. Urbana: Computer-Based Education Research Laboratory, University of Illinois, 1976. (ED 122 308)

The Community College English Lesson Index is a catalog of PLATO programs available to institutions associated with the University of Illinois computer network. The catalog lists programs in the following categories, with the number of programs in each: Capitalization, 5; Composition, 4; Editing and Proof-reading, 8; Grammar, 35; Poetry, 3: Punctuation, 15; Research, 4; Spelling, 9; Usage, 7; Vocabulary, 2; Miscellaneous, 5.

The listings give the filename and the ecs. number (not defined), the author, objective, description, estimate for student time to complete, grade level, and specific notes in some files. The catalog introduction indicates that further programs are available in the Language Arts Routing Series, but it does not describe how LARS differs from the material cataloged here.

It would be helpful if background information were supplied about such material as the type of system needed to run these programs, wider access, and further cross referencing to or information about related programs. As presented, the catalog of programs cannot help a potential user external to the University of Illinois system. If the programs are restricted to that particular system, simply noting that would itself be helpful.

The focus of the PLATO program is clearly on relatively low level cognition skills in composition; its use would therefore be remedial rather than rhetorical in a freshman composition course.

Kane, Janet H. "Computers for Composing." Paper. Annual Meeting, The American Educational Research Association. Montreal, April 11-15, 1983. 20 p. (Ed 230 978)

Studies show that student writers revise relatively little, in contrast to expert writers. This review of a study of five eighth-grade students suggests that the use of word processors in schools might shift the writing habits of students toward those of expert writers. The study focused on a teacher and on five students, all with little or no computer experience. In a five-week mini-course, meeting twice weekly, the students were instructed in the use of the word processor (Applewriter), and guided in expressive writing. Based on reports of direct observation by two researchers, and by pre- and post-experiment interviews, the author draws the following conclusions:

a. The students preferred the word processor to pencil and paper, especially because there was no mess in revising.

b. Composing processes were not naturally changed by the technology. For instance, the students produced text linearly, correcting all errors as they proceeded.

c. Students spent up to five times longer composing with the word processor than with pencil and paper.

d. Students were highly involved in their tasks. The room was quiet.

e. Students revised more freely than normally, including revising paragraphs. They preferred revising on the screen rather than on hard copy.

f. Students tended to work in isolation.

The author suggests that a great deal of software is too complicated for classroom use, but that the program used here presented no serious problems. She suggests, further, that computers are often used in mathematics and computer programming classes, but not very often in composition classes. Based on the results from this program, that pattern may need changing.

Kelly, J. Terence, and Kamala Anandam. "Teaching Writing With the Computer as Helper." AACJC Pocket Reader 2 (Washinton D.C.: American Association of Community and Junior Colleges, 1982), 58p. (ED 214 583)

Miami-Dade Community College has developed an instructional management system (CMI--Computer Managed Instruction) called Response System with Variable Prescriptions (RSVP). This report focuses on the RSVP feedback system, which follows a standardized outline: a) students submit writing; b) the instructor reviews

the writing and determines a suitable response level; c) the instructor comments on the paper and calls for further suitable standardized responses from computer files; d) the computer provides appropriate explanations and exercises for the student.

The RSVP feedback program therefore focuses on teacher grading combined with positive and timely computer feedback which includes remedial instruction, in some cases referring the student to textbook material. Further the program keeps track of the feedback to each student, thereby building a cumulative profile of each student's progress. Though derived from computer files, each feedback form is presented to the student as a coherent, personalized letter. If the student feedback contains three references to the same problem, the letter encourages the student to see the instructor.

This write-up contains samples of marked student writing, complete with instructor comments. It also includes examples of computer-generated responses.

The object of the RSVP program is to provide instructors with classroom management assistance and students with a relatively quick response program to help them improve their essay writing skills through advice and exercises. Hence the program focuses on response at the level of product rather than intervention in the composing process.

Kiefer, Kathleen, and Charles R. Smith. "Improving Students' Revising and Editing: The Writer's Workbench System." The Computer in Composition Instruction: A Writer's Tool. Urbana: NCTE, 1984. 65 - 82.

Rather than developing its own courseware, Colorado State University has adapted Bell Laboratory's THE WRITERS' WORKBENCH to its own needs. The CSU program began with four programs ("Style," "Diction," "Suggest," "Spell") in two composition sections in September 1981, but shortly thereafter expanded to the entire composition program of 4,000 students, using twenty-seven terminals and four Onyx computers, compatible with Bell Laboratory's VAX compatible operating system.

Students prepare their drafts at home (to save terminal time) and then type them into the computer for feedback, which is now available in seventeen programs focusing on organization, paragraph development, diction, abstraction, spelling, punctuation, usage, and style, programs which Kiefer and Smith detail in this article.

Student response to the programs has been generally positive, with the greatest value of THE WRITERS' WORKBENCH lying in its ability to sensitize students to potential problems in style, rather than just pointing out error. Controlled tests also indicate that students using the system improve 40 to 50% more than students in traditional situations. The suggestive rather than prescriptive or self-correcting element of the

programs, though, can fit a rhetorical orientation in composition, since the emphasis is on making choices. Kiefer and Smith report that some instructors, in fact, capitalize on this feature of the programs, discussing with students the impact of works written in various styles.

Kuchinskas, Gloria. "Developing Interactive Language Experiences for the Computer." Computers in Composition Instruction. Eugene: International Council for Computers in Education, 1984, 65 - 73 (ED 240 742).

As part of the focus on courseware design in Robert Shostak's collection of essays, Kuchinskas presents four principles underlying the development of interactive language programs for the computer:

1. Programs must focus on the productive, not the receptive aspects of language.
2. Programs must emphasize learning based on modeling.
3. The computer must be presented as a motivator in learning.
4. The child must be an active, not a passive participant.

Kuchinskas' article provides examples of these principles in simple sentence expansion exercises, complete with an appendix containing BASIC programming for the TRS-80 III.

Lathrop, Ann. "Courseware Selection." Computers in Composition Instruction. Eugene: International Council for Computers in Education, 1984, 75 - 80. (ED 240 702)

As of the writing of Lathrop's article, about 8,000 programs were advertised for the education market; only five to ten percent of these fell into the good to excellent category. Lathrop therefore presents a number of suggestions for choosing courseware. First, Lathrop suggests a range of evaluation instruments, her top recommendation for schools and college being The Guidelines for Evaluating Computerized Instructional Manuals, published by the national Council of Teachers of Mathematics. Second, Lathrop suggests that critical reviews in journals be used for courseware selections to be tested; reviews should not be the basis for purchasing courseware.

Prior to purchase, courseware should be classroom tested, preferably with all users, including student users. The following criteria are important:

1. Stated or implied goals;
2. User friendliness and usefulness;
3. Equipment needed;
4. Compatibility with curriculum.

Lathrop also suggests that reviewers go through the program assuming the role of a good student, a poor student, and a

student bound to circumvent or crash the program. Finally, she asks whether the program makes good use of computer tehcnology or whether the print medium might be better suited to the learning involved.

Lawlor, Joseph. "Evaluating Textual Responses." Computers in Composition Instruction. Eugene: International Council for Computers in Education, 1984, 59 - 64. (ED 204 702)

Lawlor discusses computing technology implications for language programs that evaluate student responses, focusing especially on differences between syntax and form categories. His sentence combining program is based on a hierarchy of steps in which the first step checks for a capital letter at the beginning of a combined sentence, the second checks for a period at the end, the third checks for a "combining signal," the fourth for the number of words in the combined sentence, and so on. If steps one or two are consistently faulty, the student is shunted to "form" remediation feedback; errors in steps three and four lead to syntax feedback. It is quite obvious that the required programming for exercises expands rapidly as the complexity of the sentences increases, but Lawlor argues that the positive student response to sensitive computer evaluation indicates the necessity of the extra programming effort.

Lawlor's program is written for the Apple II or II+ with dual disk drives and an Apple clock. Hence the programs are within the composing range of a good amateur programmer and within the hardware capability of even limited school budgets.

Lesgold, Alan M. "A Rationale for Computer-Based Reading Instruction." Classrom Computers and Cognitive Science. New York: Academic Press, 1983, 167 -180.

Lesgold's article begins with a review of reading research at the cognitive level. It then attempts to apply what has been learned in reading to the problem of developing interactive computer games that focus on practice in word recognition and on providing diagnostic data related to children's progress. The article presents models for game shells that students fill in and then use for practicing vocabulary and comprehension skills while the computer monitors the children's decisions. The resulting data, therefore, provides a diagnostic profile of each user as well as general profiles for comprehensive research.

Though some of the programs Lesgold describes could be run on simple computer systems, Lesgold emphasizes the need for sophisticated hardware to run the complex programs, since the possibility of inter-activity is required at the level of tutorial feedback to students completing and playing the games and at the level of meaningful data output for lay observers

(such as parents or school superintendents who may question the value of these programs).

This article does not present a ready-made model for reading instruction, but it presents parameters that indicate the author's awareness of the social context, including students, teachers, and parents, within which classroom computers operate. The article combines a complex awareness of both reading instruction and computer capability.

Levin, James A., Marcia J. Boruta, and Mary T. Vasconcellos. "Microcomputer-Based Environments for Writing: A Writer's Assistant." Classroom Computers and Cognitive Science. New York: Academic Press, 1983, 219 - 231.

THE WRITER'S ASSISTANT is designed to help writers generate and modify their own text. This program is especially formulated to trace keystrokes, so it acts as a protocol, recording all data entered and revised in the order of initial entry. Used with a field observer noting student interaction, especially the interaction between individuals of a pair working at the terminal, the program has yielded a lot of data about decision making.

THE WRITER'S ASSISTANT is for elementary school settings with a single computer per classroom, but where the teacher is available for varying amounts of support, as needed. Novice

writers or computer users might just fill in blanks, intermediate users might write in response to teacher or computer prompts, and experts are free to compose as they wish. Students appreciate the program especially because revisions and corrections are easy and neat, and spelling and meaning are easily verified with a built-in dictionary.

Pre- and posttest comparisons of an experimental group with a non-computer control group showed a marked improvement by the experimental group in average length of writing sample and in quality of writing judged in a blind text. Future work will include using the computer to record decisions in interactive text generation similar to "Story Maker" (Rubin, q.v.), to exchange messages with children in distant schools (California - Alaska), and to involve children in a variety of writing games.

McDaniel, Ellen. "Using Computers to Write About Computers and Writing: A Lesson in Comparative Literacies." Computers and Composition, Special Issue (April 1984), 213 - 232.

Scholars like Walter Ong have reminded us that the alphabet and writing, as technologies, originally separated knowledge from experience. McDaniel compares computers, also as a new technology, to writing and to the printing press, in their impact on the evolution of human expression. McDaniel sees the first uses of the computer as lacking in innovation over the use of typewriters and a fixation on the printed page. But this follows the pattern set by early writing, which originally did little but transcribe orality.

Shortly, however, the computer medium will likely change its message and its maker, just as the printing press "changed human thought and consciousness far more than it has been given credit for." In making textbooks available, for instance, the printing press democratized and thus immeasurably expanded the impact of education. In much the same way, as computer literacy spreads, computers will change our practices and values McDaniel suggests.

Just as the pocket calculator is already changing elementary and high school students' attitudes toward computation, so ever more sophisticated text formatters will change writing habits and writing instruction. And as the printing press became the hub of educational and social activity in the nineteenth century, so, McDaniel holds, the computer is already leading to business and

educational liaison and collaboration unknown a generation ago. Further, McDaniel sees writing giving way to far more graphics and numerical presentations than is the case at present, and, with hardware like word synthesizers, computers will even foster a return to orality. Even now already, the computer is becoming a standard extension of human memory, what with information from computerized data bases far more accessible than information in libraries.

McDaniel acknowledges the fear some have of changes, but suggests that this fear of change has always been with us. She is correct, of course. In the Phaedrus, Socrates disparages writing, and the renaissance church preached damnation to those who interpreted the newly printed Bibles. However, changes are inevitable, as even now we find computer links replacing personal long distance telephone calls and the traditional mail system. Gradually the dependence on paper printed copy will also give way to far greater use of the purely electronic medium. As this happens, our educational goals will necessarily change as well.

Malone, Mary Ann. "Computers in the Classroom." Teachers at Work: Articles from the Ohio Writing Project. Eds. Mary F. Hayes, Max Morenberg, Janet Ziegler. Oxford Ohio: Summer Institute, Miami University, 1982. ED 232 209.

Though software development is slow, computers are valuable because they provide for an active learning situation that is individualized, private, and engaging--especially in games. Computers are flexible, for they allow student composing and instructor feedback, they allow for student revision, and they allow for neat printing. Further, composing automatically turns into reading from the screen.

Malone reports of a 1965 study by Ellis Page, "Project Essay Grade," in which computer programs were written to measure surface features of essays from Grades 8 to 12. On the basis of this data, computers graded papers with results statistically indistinguishable from results obtained by expert graders. Malone also reviews the use of computers for classroom management.

The article has a strong emphasis on the theoretical potential for computers in the English or Language Arts classroom, especially at the elementary level, but also at the high school level.

Marling, William. "Grading Essays on a Microcomputer." College English 46, (December, 1984): 797-810.

The problems with using some traditional text editors in composition classes is that they are expensive and often require a relatively long learning time. As a result, Marling used the generic Vedit program from Compuview, customizing it to his own purposes. He wrote three programs, "Writer," a text processing system; "Grader," a class recordkeeping and grading system; and "Reader," a system incorporating "Grader" comments into student papers, which students would then read on terminal screens.

Evaluating his own program, Marling notes that freshman students who were novices at the computer had a hard time learning to use the system. Sophomores and juniors who were comfortable with terminals were the best candidates for composing at computer terminals. Knowledgable writers at terminals used 75% of the time that comparable students in a control group at typewriters used. Marling's tests also showed better error detection and correction in revising at computer terminals than at typewriters.

Marling states that his "Grader" program was of marginal help in grading student papers, primarily because of the high learning time required to use the system. However, it was valuable in monitoring student progress, since it allowed recording the counts of various writing problems. Marling also notes that composing at terminals situated in a noisy setting was

difficult for most students.

The author combines computer literacy with expertise in composition pedagogy, a combination that many writers in composition research praise. The author's expertise allows him a flexibility denied most other researchers in this area. This study also presents a situation of high student access to computer terminals for composition purposes rather than for computing classes, which is also relatively unique. Nevertheless, the focus of the article is still on questions of error detection and correction and on writing speed rather than on the cognitive processes of writing, where the largest breakthrough in CAI must come if computers are to be of significant help in composition classes.

Neuwirth, Christine M. "Toward the Design of a Flexible, Computer-Based Writing Environment." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 191-205.

In this chapter of Wresch's collection, Neuwirth describes the plans of Carnegie-Mellon University to build a highly flexible system that corresponds as closely as possible to the varied composing patterns of students. A second feature of the planned program is its obvious research orientation in its provision for flexibility in instructor intervention in the students' writing process, as well as for continued monitoring of student activity. A distinct systems evaluation focus is therefore an integral part of the whole plan.

The program itself is built on a split-screen approach, with the student's draft in one window and reference material in the other, or the student may work with two pages of a draft simultaneously. Further, the student may access global options, such as EDIT, HELP, BACK (access previous page), NEXT (access next page), or MARK. This MARK feature offers the program a flexibility few word processing programs offer: it allows direct access to any specifically marked part of the draft, thereby allowing the student a great deal of freedom in moving within his or her already completed text.

The DRAFT program reflects a sophisticated approach to the use of word processors in composing. It combines a required

facility with computer hardware with a serious attempt to allow the student the freedom to manipulate the computer that appears to be modeled on the activity of the monitor in the writing process model of Linda Flower and John F. Hayes.

Neuwirth stresses repeatedly that questions about writing process theory are central in many programming decisions. With the monitoring and instructor intervention facilities built into the DRAFT program, the experimental programs at Carnegie-Mellon will produce valuable research information for both computing and for composition when this program becomes operable.

Oates, William. "An Evaluation of Computer-Assisted Instruction for English Grammar Review." Studies in Language Learning 3 (Spring, 1981): 193-200. (ED 218 945)

Indiana University has used the PLATO computer assisted instruction package for five years in its writing lab and in beginning writing courses. The focus has been on grammar, punctuation, word usage, and spelling. The PLATO program drills, questions, reviews, and skips ahead when competence is shown. Results from formal student evaluation studies describe it as friendly and personal, pleasant, communicative and interesting. Instructors using the program consider that it allows them to focus on higher order cognitive skills than those treated in the program. The program includes electronic mail capability between

faculty and students. The major source of frustration at Indiana University is hardware shortcomings--terminal problems and inadequate computer memory space.

This report reviews a study of twenty CAI-instucted students in a beginning newswriting class, and sixteen in another non-CAI beginning newswriting class, used as a control group. A standardized set of pre and posttests was administered to both journalism classes, neither of which included any formal grammar instruction. The results of the tests showed no significant difference in the mean score of the non-CAI class, though the CAI class mean improved by twenty points, which was significantly higher than its starting mean.

As presented, this study demonstrates the capacity of computer packages to deal with instruction at relatively low cognition levels, such as instruction in grammar and usage. The study is does not specifically compare the effectiveness of computer assisted instruction with non-CAI instruction; it does not compare, for instance, grammar and usage instruction by computer versus grammar and usage instruction in a normal classroom. The attitude tests, however, reflected that the students preferred computer assisted instruction to small-class instruction.

Pedersen, Elray. L. "TICCIT Will Gladly Learn and Gladly Teach Composition Skills." Computers and Composition, Special Issue (April 1984), 233 - 241.

Pedersen's article updates readers about the Time-Shared Interactive Computer Controlled Television system at Brigham Young University (Alderson, 1978, q.v.). Twelve years after its inception, TICCIT is used at BYU in subjects as diverse as foreign languages, English composition and reading, mathematics, or music.

All TICCIT lessons follow a similar format of instruction in focusing on OBJECTIVES, RULES, EXAMPLES, AND PRACTICE. After reviewing the OBJECTIVES lesson in any specific course module, the student chooses one of the other three routines. TICCIT EXAMPLE files present the student with up to forty different applications and illustrations of the objective being learned or the rule being applied. If the level of illustration or practice is too advanced, the student may call up a HELP file for easier work; alternately the student may also call up a HARD HELP or a HARD PRACTICE file for challenging lessons.

In composition TICCIT lessons range from materials related to the word (such as spelling, diction) to materials related to the sentence, the paragraph, and to the whole composition. Ninety-eight of the hundred items tested in the Harbrace College Handbook Diagnostic Test are covered by TICCIT instruction.

Pedersen nowhere describes the TICCIT approach as having

replaced the classroom instructor, one of its original objectives (Alderson, 1978, q.v.). However, he says the computer programs free the instructor for consultation time with students. Further, student learning is self-paced, and the subject matter and exercises are "interactive, interesting, provocative, and relevant." He describes TICCIT as a "benchmark of current computer technology," and a base for yet further developments in computer-assisted education.

TICCIT and microTICCIT are marketed by Hazeltine Corporation, McLean Virginia, 22102. TICCIT typically requires a Data General Nova 4X mini computer as main processor and a Nova 800 as terminal processor. The processor costs roughly $50,000 plus $6,700 for each terminal.

Petersen, Bruce T., Cynthia L. Selfe and Billie J. Wahlstrom. "Well, It Looks Good, But Can It . . .?" 1983. 15p. (ED 234 393)

Using the computer for lower cognitive level instruction, such as presented in Houghton Mifflin's Dolphin Language Series and in the PLATO programs, is fairly straightforward, but more complex programs for composition require close collaboration between computer programmers and writing instructors. Since many programs on the market are of questionable value, the authors present a series of CAI program evaluation questions, followed by general questions about CAI research and composition pedagogy.

Evalution of CAI Programs

1. Does the program address specifics of the writing process--purpose, audience, planning, organization, development, etc.?
2. Does the program have a true process orientation, offering a variety of heuristics for one or more stages of composing?
3. Is the program aim and mode specific?
4. Does the program focus on writing rather than on drills?
5. Does the program allow a variety of approaches to writing?
6. Does the program reflect good computer programming as well as good composition pedagogy?
7. Is the program student compatible; has it been tested in a writing situation?

Research Questions

1. Does CAI have built-in limitations that keep programs too simplistic for excellent composition pedagogy? Can students generalize knowledge gained through CAI?
2. Do classroom results demonstrate student benefit from computer supplemented instruction?
3. Does CAI offer anything that a human tutor cannot?
4. Can CAI offer improved student attitudes toward writing?
5. Does CAI relate to some modes and aims better than to others?
6. Does CAI encourage activity at all levels of the writing process?

Using a variety of testing instruments, the authors, themselves all using CAI in teaching composition, are involved in their own evaluations of CAI at Michigan Technological University.

Rodrigues, Dawn, and Raymond J. Rodrigues. "Computer-Based Creative Problem Solving." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 34-46.

The Rodrigues have developed a number of intuitive inventional strategies. In the first, the computer asks the student general, leading questions about how the topic the student has entered into the computer might relate to details in a picture the student has drawn from a packet. When the student is finished typing analogies, the computer asks the student to elaborate on each entry, one by one.

The Rodrigues derived their first program from a Rogerian, non-directive counselling package, which they analyzed at home. Their programs are now used in the writing lab, where use can be monitored. Since students do not all respond similarly to particular inventional strategies, variations are planned. The ultimate goal is to build a number of inventional approaches into a single master program, letting the students choose their own approach, possibly shifting approaches in order to expand their brainstorming.

A further area for research lies in the proper tone for computer prompts. How do students respond differently to the straight- forward question approach (WHAT IS THE MAIN POINT YOU WILL MAKE ABOUT [___TOPIC____]?) from the way they respond to the enthusiastic approach (TERRIFIC! AH, SHORT AND SWEET! TELL ME

MORE)?

The Rodrigues' approach requires rather simple hardware such as Radio Shacks, Commodores and Apples. Hence it should be accessible to most schools. The authors point out, though, that when they have presented the concepts to teachers at workshops the teachers have often thought about the prewriting approach itself as little as they have thought about the use of microcomputers in the English composition classroom. Again it becomes clear that the computer is only a teaching aid, not a replacement for the teacher. As such, the aid must be used wisely, for abuse could lead to dependency, or to the computer becoming a classroom-bound heuristic device, as the authors themselves suggest has happened with other inventional heuristics common in some writing programs.

Rubin, Andee. "The Computer Confronts Language Arts: Cans and Shoulds in Education." Classroom Computers and Cognitive Science. New York: Academic Press, 1983, 201 - 217.

Although most software for schools deals with material similar to that found in traditional textbooks and workbooks, or with low cognitive level word or letter choice activity, the goal of QUILL, a computer-based writing curriculum for elementary schools, is to free children's attention from low-level processes such as handwriting and spelling. The aim of QUILL's authors is to focus children's attention on rhetorical choices. Structured in tree form, one of QUILL's programs entitled "Story-Maker" leads children to choose from given sets of text to create a story. In "Textman" students are given writing parameters within which they combine given sentences into acceptable sequences. At the time this article was written, "Textman," based on research relating to common sentence-combining errors, was still being developed.

The traditional use of the computer in low-level skills is also superseded by the use of a word processor in revising, and by programs in QUILL that produce copy in attractive formats, fostering students' pride in their work. Further programs elicit students' questions, which other students answer in a networked system. The goal of QUILL is to use the computer as a communication tool rather than as an object separating individuals from each other.

Rubin's article emphasizes the creative and social potential of computers in the elmentary school classroom, but the principles on which the system is based applies much more widely than to the elementary school classroom alone.

Sadler, Lynn Veach, and Wendy Tibbetts Greene. "Computer-Assisted Composition at Bennett College." Computers and Composition, Special Issue (April 1984) 243 - 256.

The Bennett College computer-assisted writing program focuses on two CAI features: word processing and an interactive structured essay writing program. The word processing composition focus is structured around peer response pedagogy combined with revision. Sadler and Greene note that word processing has almost doubled the quantity of students' writing. And the quality of writing, as revisions from the word processing lab come in, increases dramatically.

The teachers grade the drafts as they come in. This results in a heavy marking load, but the reward is that students confront their own products as part of a process. Increasingly the teachers simply circle writing problems without identifying them. This leaves students to think about the nature of the problem as well as the nature of a revision.

Student response, judged by questionnaires, has been very favorable to the recently instituted program, based in a writing

lab with ten IBM PC's. Originally the English Department used the college's mainframe, but this was found to be unsatisfactory (the reasons are not given).

To meet the needs of weak students, the Bennett program has made up an interactive program which leads students through pre-writing, writing and editing. The program is seen as an elementary form of WANDAH, (Von Blum, Friedman, q.v.), which is itself to be incorporated into the Bennett program shortly.

The Bennett approaches appear to be geared to a more favorable student-instructor ratio than is found at many colleges. Sadler and Greene note that, as drafts of a paper are read by the teacher and revised by the students, quality may improve from an F to an A level. Students are free to revise as often as they wish, presumaby with their drafts being read by an instructor each time. Such an approach leads one to question whether the favorable student response to the program is related only to the presence of computers or whether the student successes under such favorable learning conditions lead to the favorable attitudes.

Schuelke, David, and D. Thomas King. "New Technology in the Classroom: Computers and Communication in the Future." March, 1982, 15p. Paper. Annual Meeting, American Educational Research Association. New York, 19-23 March, 1982. (ED 217 879).

Schuelke and King range widely, reviewing general language arts research in computer assisted instruction prior to 1981, then focusing on the use of computers in reading and comprehension, in composition, and in organizational communication and information networking. They conclude that the computer's focus on information makes it imperative that those teaching communicative skills become "computer literate," stressing that communication instructors of the future will necessarily evaluate computer communication as well as other forms of communication. Schuelke and King especially mention the need for instruction in research to include computer accessible bibliographical material.

This presentation is useful as a reference to studies prior to 1981, especially in the areas specified above. In an appendix the article includes twenty-six references and a list of 140 commercially available online databases, including material relating to multidisciplinary academic interests, to the social sciences, to the humanities, to the sciences, to the technologies and to business. (In modern languages, for instance, the MLA bibliography is one of the databases.)

Schwartz, Helen J. "SEEN: A Tutorial and User Network for Hypothesis Testing." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 47 - 62.

Schwartz begins by describing the mechanics of the SEEN program, which prompts students for responses to material being studied in literature courses. The object of the program is not only to help students generate ideas for composition but to engage students in discussion about the literature they are studying. The answers students give to the prompts are entered into a network, so other students can see the initial responses and then respond further.

Schwartz considers her approach with individual disks for student groups as inadequate for large groups of students. She believes the computer approach in literature study should be optional since it is unsuitable to the personality of some students. All students should have group or individual conferences and journals available as well. She argues that the program should be ungraded, playful, used for exploring ideas with classmates or with the program alone.

Student responses reveal three basic patterns: listlike factual reviews, coherently argued responses, and "Eureka" reactions that interrupt listings when a student suddenly finds an argument that gives coherence to facts. Student questionnaires have also revealed that the program helps the

students to read the literary works more and to read them earlier. Schwartz notes as well that students tend not to pick up errors from fellow students, nor has plagiarism been a problem.

At the moment the program is a tutorial based on short answers, but Schwartz plans to integrate the approach with word processing capability, thereby integrating the approach into a compositional prewriting tool.

Schwartz has developed the system, including the BASIC programming, herself. She acknowledges heavy dependence on colleagues with engineering and computing expertise. She also refers to her forthcoming book about computers in composition, which should provide information on new composition approaches as well as on how humanities instructors can most effectively learn how to adapt computers to their classrooms.

Selfe, Cynthia L. "Wordsworth II: Process-Based CAI for College Composition Teachers." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 174-190.

WORDSWORTH II is a cooperative venture of English instructors and computer scientists at Michigan Technological University. When finished, it will consist of eight process-based modules to supplement classroom composition instruction in

description, narration, classification, evaluation, persuasion, writing personal journals, comparison-contrast, and writing about literature. Selfe's article describes the first module on narrative writing.

The modules are designed by English instructors and programmed by computer science students averaging about five hours a week of work throughout the semester. When first completed, the programs are extensively field tested in the writing lab, with both English instructors and programmers involved in the review.

The modules are each structured into two programs, "Planning" and "Polishing," with "Polishing" being further subdivided into guiding students in early, middle and late drafts. Guidance is given in the form of general questions relevant to the respective drafting concerns of the particular portion of the writing process in which students find themselves. Further, the questions are structured to allow either cursory or detailed analysis, depending on the students' preference.

Initial student reaction to the program has been positive. The author suspects that students enjoy the privacy of the computer lab setting to expand ideas or to try techniques without immediate feedback. Teachers in experimental sections have reported that they find themselves reviewing previously discussed techniques less frequently in CAI classes than in other classes if the material is covered in the computer program. However, the article reports that no definitive results about student progress

are yet available.

The great advantage of this program is that it prompts the students to write extensively, with the program prompting the clarification of ideas. In this approach the initial programs dealing with the early and middle drafts focus on defining and relational skills within the context of writing, thereby requiring high order integrative cognitive skills before the programs focus on the detailed, lower order individual skills of word choice and punctuation review.

Shostak, Robert, ed. Computers in Composition Instruction. Eugene: International Council for Computers in Education, 1984. 89 p. (ED 240 702)

Computers in Composition Instruction supplements the proceedings of a 1982 SWRL Educational Research and Development conference with selected articles from The Computing Teacher, an ICCE periodical. Shostak's volume follows an opening survey article by Shostak (see below), with four essays on computing and the writing process (Burns, Schwartz, Woodruff, and Wresch),three essays on courseware design (Bork, Lawlor, and Kuchinskas), and one essay on courseware selection (Lathrop). (All of the authors mentioned are reviewed in the present annotated bibliography.)

Shostak, Robert. "Computer-Assisted Composition Instruction: State of the Art." Computers in Composition Instruction. Ed. Robert Shostak. Eugene: International Council for Computers in Education, 1984, 5 - 18. (ED 240 702)

Shostak reviews the "state of the art" in computer-assisted composition instruction, organizing his essay to follow stages of the writing process. In pre-writing, he mentions "Story-Maker," developed by Andee Rubin (q.v.), which focuses attention on

Shostak, Robert. "Computer-Assisted Composition Instruction: State of the Art." Computers in Composition Instruction. Ed. Robert Shostak. Eugene: International Council for Computers in Education, 1984, 5 - 18. (ED 240 702)

Shostak reviews the "state of the art" in computer-assisted composition instruction, organizing his essay to follow stages of the writing process. In pre-writing, he mentions "Story-Maker," developed by Andee Rubin (q.v.), which focuses attention on high-level cognition in elementary school children. Shostak also reviews Hugh Burns' work (q.v.). In discussing the drafting stage, Shostak focuses on the impact of the word processor and related grammar and spelling checkers, all of which are leading students to write more and longer texts, though Shostak mentions that no evidence has yet shown that the quality of student writing is improving as a result of the new technology. Shostak

also discusses Stephen Marcus' program COMPU-POEM and Edmund Skillings' THE ELECTRIC POET, a program combining color, animation and graphics, and formatting flexibility.

In the rewriting and editing discussion, Shostak begins with the work of Robert Wisher, who focuses on sentence combining, paragraph revision, and writing by models. Next, RSVP, developed by Kamala Anandam (q.v.), features personalized essay feedback as well as a cumulative student writing profile. Probably the most advanced editing system available today is Bell Laboratories' "The Writer's Workbench" (Kiefer and Smith, q.v.). A further large system, QUILL (Rubin, q.v.), will soon present a whole curriculum for upper elementary students. It will include "Planner," which will prompt students to make notes and write down ideas, "Library," which will prompt students to organize material for easy retrieval, "Publisher," which will produce texts in various formats, and "Story-Maker" (Rubin, q.v.) and "Writer's Assistant," a flexible text editor designed to work with the other programs in this system.

Shostak's article concludes with purchasing information for the programs he has mentioned.

Smith, John B. and Catherine F. Smith. "Spatial Thinking and Top-Down Writing." Computers and Composing, Special Issue (April 1984), 257 - 270.

The authors in this article stress the relevance of spatial thought as well as linear, word-based thought in writing. They give examples of engineers sketching models before writing, of economists drawing graphs, and of geographers envisioning land formations. Because these are all forms of spatial thinking, the authors consider a spatially presented outline--an upside down tree structure--suitable to prewriting.

The upside down tree structure is chosen because it leads easily to a top-down prewriting model, which is the centre of the Smiths' interest in this article. Software engineering, according to the authors, goes through four stages: design, coding, testing, and maintenance. This article relates these categories to the writing process, suggesting that 40% of any writing task be given to the design stage, which, in this program, is a matter of successively filling in a programmed diagram on a screen. Rather than moving from beginning to end in planning then, a writer moves around the tree structure, filling in information until the designing stage is finished.

The program proto-type was planned for completion by July 1, 1984, and was to run on the University of North Carolina VAX system. Future improvements are to include multi-windowed work stations, which will allow freedoms not yet incorporated into the

present program.

Sommers, Elizabeth. "Classroom Research on Word Processing and Writing Processes." Computers and Composition, Special Issue (April 1984), 271 - 276.

Sommers' research focuses on two questions: "What happens to student writing processes when word processing is combined with sound writing instruction?" and "What effect do word processing and sound composition instruction have on writing quality?'

Sommers has an experimental class of twenty students, whom she teaches largely on a one-to-one basis, with the microcomputer as an addition, not a replacement, to instruction. In addition, the students may confer with a class assistant and with peers. Selected information about each each draft of every paper is charted. Sommers also keeps her own daily logs of class activities. All of this information is to lead Sommers to conclusions about how student writing processes under the conditions described have changed from traditional writing practices. Preliminary student responses indicate that student writing patterns have indeed changed, but perhaps the changes are as much from the student-instructor conferences as from the computer- assisted setting.

The specific effect of the computers, however, will be isolated by the presence of a control group taught by another instructor using the same approach to teaching, but without the

use of computers. Both groups have been pretested, and both will be post-tested, with calibrated raters scoring unidentified papers holistically.

To provide further data, the writing of four students in the computer group is to be analyzed closely, especially the revisions processes of that writing. The Faigley and Witte (1981, 1984) taxonomies are to form the basis of this analysis.

Studies like this will ultimately provide important information about how the simple presence of computers is changing composing patterns of today's writers. Much attention in recent years has been given to specifically developed interactive instructional courseware, but, because of their accessibility, word processors may have a far more profound effect on writing than the presence of specifically designed courseware.

Southwell, Michael G. "The COMP-LAB Writing Modules: Computer-Assisted Grammar Instruction." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 91-104.

Michael Southwell argues that intensive and systematic instruction in grammar can improve the quality of basic writers whose writing exhibits severe problems in correctness and clarity. The COMP-LAB Writing Modules, based on a textbook The COMP-LAB Exercises,(Prentice-Hall, 1980), when completed, will

contain modules on noun plural forms, verbs and subjects, verb agreement, past-tense verb forms, and to-be verbs. Teaching within the context of writing rather than short-question drills, this approach focuses on five points:

1. Limiting the instruction to noun and verb forms in order to focus on both pervasive and stigmatizing errors.
2. Assuming no student knowledge of grammar.
3. Teaching only one new concept at a time.
4. Recapitulating former material while presenting new concepts.
5. Where possible, using the forms in sentences and, to a limited extent, in paragraphs.

The lessons are carefully structured, beginning with an introduction to the computer and with passwords ensuring that the correct progession is followed. At York College, where the program is being built, the modules are totally autotutorial, done in the writing lab at the students' own time, and done at the students' own speed and on the student's own responsibility. The classroom is therefore used for instruction in composition and rhetoric rather than for grammar.

Southwell's approach is to treat the basic writer like an English as a Second Language student, so presumably the modules could be used in ESL classes as well. The examples provided in the article are elementary, but the author hopes eventually to provide sentences with prepositional phrases or dependent clauses

interrupting the subject-verb pattern. York College plans to supplement the grammar modules with word processing and with heuristic programs, and to provide sufficient hardware for a whole class to work at once. Southwell writes that experimental results are not yet available, but that the students are enthusiastic about the approach.

The article reflects close cooperation between at least three instructors at York College, a situation that appears to provide the stimulation for critical yet practical planning. Further, because the programs are being planned on the assumption that the students have no grammatical knowledge, the modules might well be suitable for the public school system as well.

Thiesmeyer, John. "Some Boundary Considerations for Writing-Software." Computers and Composition, Special Issue (April 1984), 277 - 291.

Thiesmeyer's central concern in this article relates to the prevalence in commercial word processing programs of self-correcting features. For instance, many spelling checkers not only identify errors, based on a built-in dictionary, but they also either correct or suggest corrections for the errors noted. The same is true in so-called "grammar-" or "style-checkers," which also offer alternatives to common solecisms in poor writing.

Thiesmeyer is concerned that such programs are anheuristic. They do not help students learn how to correct their problems because the programs do the corrections for the students. Thiesmeyer notes that though we need not use such self-correcting programs in our classrooms, their ready availability commercially may well have a bad influence on large numbers of writers.

Thiesmeyer concludes with a brief reference to the possiblity of "Fifth Generation" computers with artifical intelligence eventually becoming "literate." He does not believe that a context-free language will be generated by machines for a long time to come. This view coincides with that of Winograd (q.v.), who notes precisely the same problem. Extensive dictionaries and massive data bases for generating grammar rules are simply not enough to confer literacy to machines.

Venezky, Richard L. "Evaluating Computer-Assisted Instruction on Its Own Terms." Classroom Computers and Cognitive Science. Ed. Alex C. Wilkinson. New York: Academic Press, 1983.

Venezky reviews CAI evaluation schemes from the simple pretreatment/posttreatment pattern to highly complex "intelligent" computer assisted instruction in which the computer response is governed to some extent by the writer's input. Venezky argues for evaluation to be inherent in the programs

themselves, so that the progress of students as well as the effectiveness of instructional sequences are readily available. All of the material must be both user friendly and teacher/classroom compatible. The article also suggests that purchasers of commercial programming for the classroom should demand that CAI lessons include built-in data collection sequences for evaluation as he has described it.

Venezky presents both simple and complex models of student-teacher-computer interaction, though at the time of writing the complex ones feasible only on networks with large storage capacities and high speed central processing units.

The scope and focus of this article should be useful for anyone either buying or authoring expensive computer programs for the classroom, in composition or in other subjects.

Von Blum, Ruth, and Michael E. Cohen. "WANDAH: Writing-Aid AND Author's Helper." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 154-173.

Von Blum and Cohen begin with a review of the composition theory which forms the basis for WANDAH, their UCLA program. They also review research that details some of the difficulties students have in using word processors. For instance, computer novices often experience a cognitive overload, which exacerbates

the writing problems of poor writers. Even good writers are often noticeably less well organized with word processors than without. First, they may type faster than they write, especially with a word processor, which allows later correction. Second, they can see only a maximum of twenty-four lines of written text at one time, so the draft text can easily become disjointed. Third, because the computer system prints out clean drafts, they are less likely to be spurned to revision than if the text is messy and needs transcribing even without revision.

WANDAH includes three major components: a carefully designed word processor; a set of prewriting aids; and a set of aids to facilitate reviewing and revising the work thematically, stylistically, and grammatically. The word processing program is designed for ease of use. It has copious "Help" instructions, so students need only about an hour's introduction to the system before they can use it. WANDAH also restores up to 750 words which may have been inadvertently erased, thus easing students' concerns about inadvertent loss of text, a very common computer problem. An especially useful feature is a split screen, which allows system material to be displayed together with the student's text.

The prewriting aids include four routines. In "Nutshelling" the student is asked to type in the purpose of the paper, the audience, and a brief summary of the content. In the second routine, "Invisible Writing," the screen blanks out until the student has written at least one hundred words. This feature is

meant to help students overcome the urge to correct and polish during the drafting stage. In "Freewriting," the third prewriting routine, a prompt urges students to write continuously. Students may not correct errors or edit in this program. The final prewriting routine, "Planning," asks the student for the title, the thesis, and supporting arguments for the paper. It also asks for possible counterarguments. When all these are given, the program allows the student to rearrange the material to form a coherent outline.

In the revising section, the program has separate routines for revising mechanics (some punctuation and word usage, as well as a spelling checker), revising for style, and revising for organization. In revising for style, the screen is again split, highlighting in the text whatever the student has called for review (abstract words, prepositional phrases, gender-specific nouns, be-verbs, and possible nominalizations). In the second screen the program tallies the analysis. In revising for organization, the program calls for nutshelling once again, for a summary overview outline, and for a review of transition words. The authors stress that all these aids work best when they are linked to class discussions of the various features of writing. The program is also set up to allow for peer and instructor response within the student text.

Von Blum and Cohen include in this article a review of the development process of the entire program, which has been based on wide instructor input. Computing Science students have been

used for programming the whole system. The developers had set the fall of 1984 for commercial production of the program, which was planned to run on an IBM PC with at least 128K RAM and two disk drives.

Though not as sophisticated in its individual functions as some other programs, the TOPOI prewriting program of Burns and Culp, for instance, or the extensive mechanical analysis of THE WRITER'S WORKBENCH (q.v. Kiefer and Smith), WANDAH is a comprehensive, flexible program that should be adaptable to a wide range of instructional approaches.

Wilcox, Lance. "The Usefulness of Computer Materials Created by Teachers: An Answer to Bork." Computers and Composition, Special Issue (April 1984), 293 - 305.

Wilcox argues with Professor Alfred Bork of the Educational Technology Center of the University of California at Irvine, who suggests that computer courseware should be created by teams of experts. While Wilcox readily admits to the value of courseware produced by such teams, he maintains that Silicon Valley can simply not know what goes on in a St. Paul classroom in January.

Taking advantage of Bork's analogy of textbook production, Wilcox first agrees that publishing companies, in fact, do produce textbooks better than do individual teachers. However, Wilcox then argues that no good teacher's instruction is governed solely by any textbook. And just as teachers generate their own

teaching and testing material, they can generate their own exercises in courseware to meet their specific needs. For this they need not know any of the powerful programming languages, such as Pascal. Often no knowledge of any computer language is needed at all, given the user friendly writing routines in commercial programs coming onto the market.

Good teaching, Wilcox maintains, will always have to supplement both textbooks and comprehensive computer courseware. The alternative would be a centralized curriculum that would necessarily have a negative impact, if not in the short term, certainly over time.

Wilkinson, Alex Cherry, ed. Classroom Computers and Cognitive Science. New York: Academic Press, 1983.

Classroom Computers and Cognitive Science focuses largely on computer-assisted instruction in the elementary school classroom, especially in the language arts. The first unit is general, discussing the history of computerized instruction, methods of evaluating computer courseware, and analyzing the impact of the computer on the dynamics of the classroom. The second unit analyzes cognitive procedures in elementary school children, with one essay on science and the remaining four on reading and vocabulary growth. The third unit discusses computer courseware, both commercial and instructor developed.

The second unit includes little discussion of computers, so essays from it have not been reviewed in this study. The first and third units, however, are valuable to anyone interested in the use of computers in composition instruction at any level. The first unit is largely theoretical, emphasizing computer capability rather than practice. Essays in the third unit review operational programs, commenting on what has been learned about cognition and about computer use, as well as on future directions in development and research.

Wilkinson, Alex Cherry. "Learning to Read in Real Time." Classroom Computers and Cognitive Science. Ed. Alex C. Wilkinson. New York: Academic Press, 1983, 183 - 199.

Wilkinson has developed a program called "Readintime," for which this article presents a technological, psychological and pedagogical rationale. The program focuses on word recognition and reading speed as a means toward reading improvement. The article also discusses reading flexibility in terms of text selection--skimming, skipping, slow reading and retreating--noting that "Readintime" might be altered to provide increased user flexibility and monitoring capability to allow researchers to study how and when a reader makes decisions about his or her reading strategies. Wilkinson thus sees "Readintime" as a tool for research and for classroom innovation.

This article compares reading from a monitor with reading from a page. The article then raises the question of how technology can affect both research and practice in reading pedagogy. Though the approach to reading is often restricted to mechanical aspects and narrow cognitive concerns, the questions it raises are important and well discussed.

Wilkinson, Alex Cherry, and Janice Patterson. "Issues at the Interface of Theory and Practice." Classroom Computers and Cognitive Science. Ed. Alex C. Wilkinson. New York: Academic Press, 1983, 3 - 13.

Wilkinson and Patterson provide an overview of Classroom Computers and Cognitive Science, of which this is the first article. They discuss the variations in defining computer literacy, variables in selecting and distributing computer hardware, factors in the training of teachers to use computers in the classroom, and the tension between cognitive research and the practical need for user-friendly software.

The authors conclude that emphasis generally must be placed on the computer as a tool for classroom activities such as composing writing or calculating, not on understanding the machine itself. As a tool it must be accessible, both physically and technically, but not central in the educational setting. As the need for suitable courseware grows, related research will

necessarily lead to discoveries in human cognition.

Winograd, Terry. "Computer Software for Working With Language." Scientific American (September 1984): 44-55.

Winograd's article is one of a series in this issue of Scientific American, which is devoted to computer software/technology. The articles are written by leading authorities in each field and focus on the following topics: computer software, data structures and algorithms, programming languages, operating systems, software for language, software for graphics, software for management, software for process control, software in science and mathematics, and software for intelligent systems.

Winograd deals with four types of programs: machine translation, word processing, question and answer, and with adjuncts to electronic mail (coordinating systems). This review ignores the first and last topics, touches briefly on word processing, and then focuses on question answering, which relates most closely to English composition. Word processing software deals only superficially with the structure of language, treating writing only as a display of character strings, so the chief problems in designing wordprocessor software relate to representation and interaction: the first concern deals with how the computer manipulates data structures, the second with the

relationship of the machine and the user. At the moment each manufacturer sets his own standards for these, based on the needs of his own hardware so "it will be quite a while before universal standards emerge and users gain the ability to transport text from one word-processing system to any other." However, major advances are being made in text formatting and text manipulation with the introduction of a pointing device such as a "mouse," which permits the user to bypass the keyboard in arranging text on the video display terminal. Winograd also mentions advances in mechanized reference works and correctness aids, such as IBM's EPISTLE, which makes some grammar judgments on the basis of 400 encoded rules. EPISTLE also has a dictionary of 130,000 words, which demands sophisticated methods of storage and searching.

In the area of questions and answers, that is, in the area of using the computer for natural language interchange, Winograd states that "no existing software deals with meaning over a significant subset of English." Some researchers see no fundamental barrier to writing programs with a full understanding of natural language, but others argue that computerized understanding of language is impossible. The elements of a language-understanding program would include the following steps, according to Winograd: phonological analysis (which would be eliminated in the case of writing, as is the case in almost all significant work being done at present), morphological analysis, lexical analysis, syntactic analysis, semantic analysis, pragmatic analysis, and , finally, reasoning. At the

morphological stage, the programs must identify a root and possible inflections, as well as a list of exceptions. For each root, the program must establish lexical features, but to do this context is often important, so complications arise. At the next stage, syntax, two problems emerge: first, linguists do not yet have a precise grammar for English, and, secondly, sentence parsing often depends on lexical features--which may be ambiguous. Hence parsing programs may be swamped by hunreds of meaningless alternatives.

The product of the syntactic analysis becomes the input for semantic analysis, but here again ambiguity is a problem, for "most of what a person knows cannot be formulated in all-or-nothing logical rules; it lies instead in 'normal expectations.'" At the final stage of pragmatic analysis, context again becomes crucial. Hence, in the only natural language programs in use, the contextual meaning is circumscribed by the builder of the system, so the user is expected to learn that context. However, Winograd considers that for widespread use the natural language approach is preferable to the artifical language approach since it presents a low initial barrier to potential users.

The book's first chapter observes that computing has not yet brought forth a Galileo or Newton, Shakespeare or Moliere. Perhaps one will soon emerge, given the rapid changes occuring in both hardware and software development. Only with the widespread use of microcomputers within the last five years has computing

become accessible especially to children, which surely must be a major factor in the nurturing of a genius. Hence we can look forward to even wider and more rapid change in the future.

Wittig, Susan. "Three Behavioral Approaches to the Teaching of College-level Composition: Diagnostic Tests, Contracts, and Computer Assisted Instruction." Paper. Annual Conference on Research and Technology in College and University Teaching. Atlanta, November 14-16, 1974. 14p. (ED 099 887)

Wittig describes a freshman elective for composition at the University of Texas: an individualized program based on diagnosis followed by proctor and computer assistance for the teacher, all within the context of a contract-based course. Wittig notes that various groups of students respond differently to computers: she singles out engineering, computer-science, and science majors, for instance, as attracted to computer modules in writing classes. In the program she describes, she gives standard worksheets to students who react unfavorably to computers.

The article mentions little about the content of the computer models. However, using worksheets as an alternative to the computer suggests that the computer programs operate at a rather low level of cognitive skill.

Wresch, William. "Writer's Helper: A System Approach to Computer-Assited Writing." Computers in Composition Instruction. Ed. Robert Shostak. Eugene: International Council for Computers in Education, 1984. (ED 240 702) 45-52.

WRITER'S HELPER is a master program linking numerous smaller programs that all focus on composition. The first set of sub-programs deals with pre-writing; the first routine simply prompts students to write freely. After the writing is completed, the routine compares the completed draft to a norm, based on the length of time spent in drafting. Two further routines focus on list generation and questions respectively. The next three routines deal with topic definition and clarification by asking comparison-contrast questions, by prompting categorization details, and by prompting review based on field, wave and particle perspectives. The final group of routines prompts for responses to further questions and prints a draft of the responses given. The whole set of programs thus far ends with an informative review of descriptive and expository paragraphs.

The next feature of this program is a menu-driven word processing package, integrated with the pre-writing routines. The word processor contains six analysis/checking programs to detect homonym, spelling, and usage errors, as well as to help

students analyze their word, sentence and paragraph lengths, and their essay readability, organization and cohesion. The whole program runs on Apple IIe hardware.

Wresch, William. "Introducation." The Computer in Composition Instruction: A Writer's Tool. Ed. William Wresch. Urbana: NCTE, 1984. 1-12.

The book to which this article serves as introduction was created to give English instructors a unified source about computer uses in the classroom, even if only as an historical document, given the rapid evolution of computer use. The book deals with sections on prewriting, on editing and grammar programs, on word processor research and applications, and on programs that integrate the whole writing process. Each chapter deals with a different program, and is organized roughly on the following pattern: the reasons for the program, a program description, a development process, program use, program evaluation, and comments on the future. The book also contains a glossary of computer terms and a bibliography.

Wresch presents six advantages to computerized education: 1. it is individualized--far more than is possible in books; 2. it provides timely help; 3. it provides quick feedback, even with feature analysis for whole compositions; 4. it saves time, especially in revision; 5. it presents writing as malleable; and

6. it frees many students from being frozen by poor spelling and grammar.

Wresch stresses the newness of the programs described in this volume, with the oldest program having been created in 1978--though the present success of computers in English rests on a history going back to the mid '60's, especially with the work of Ellis Page (Mary Ann Malone, q.v.). Three basic approaches were set in the first decade of computer use in English: writing analysis (Page and Hiller), questioning (Nold), and word processing. In the first projects, many English instructors wrote their own programs, but recently programs have become collaborative efforts between professional programmers and writing experts. Indeed, all of the creators of the programs discussed in this book have Ph. D.'s, either in English or education. In spite of this, in almost every case reported here, the largest block of development time for each program has been spent in reviewing and testing, which suggests that developing courseware useful for the composition classroom is a difficult task since it must be both technologically and pedagogically sound.

Wresch writes that the future of computers in composition is nebulous because changes are coming with dizzying rapidity. For instance, no microcomputers existed before 1977, and a $2,000 micro today is capable of most things a $.5 million business computer did fifteen years ago, but the micro does them three times faster. With costs still dropping and computing power

rising, artificial intelligence may soon be commonplace. And with more and more people becoming computer literate, the future is impossible to predict.

Woodruff, Earl. "Computers and the Composing Process: An Examination of the Compter-Writer Interaction." Computers in Composition Instruction. Ed. Robert Shostak. Eugene: International Council for Computers in Education, 1984, 33 - 44. (ED 240 702)

Working in conjunction with Carl Bereiter and Marlene Scardamalia, Woodruff has developed three grade-school programs whose object is not primarily to help a child compose a piece of writing but rather to expand its relating skills in composing. The first program combines a text-editor with special help menus based on simple inventional heuristics. A segment of the program also allows students to flag words of uncertain spelling or meaning, thereby permitting writers to continue composing but to return to these trouble spots later. The results of this program have not shown significant writing improvement over the norm. The author hypotheaizes that the prompts are at too low a cognitive level.

The second program intervenes at the end of every sentence, asking questions related to content in previously written material. Initial tests have shown that students learning keyboarding are overloaded with this level of intervention,

though students at the grade eight level have responded favorably to the questions themselves. The third program requires students to combine sentences prewritten in a variety of styles to discover the rhetorical impact of different styles when the structure and content of the material is kept constant. The program has been used in a grade twelve setting, in conjunction with discussion on audience and style.

Though these programs are new and appear to require further testing, the approach indicates how an interactive computer program can provide much more individualized questioning on a wider variety of responses than is possible with print material. The second program, for instance, designed to pick up content based on key words, can combine writing and questioning in a continuously developing text.

Zoller, Peter T. "Composition and the Computer." 1975, 7p. (ED 127 611)

Zoller's paper reviews the use of computers in a pilot test program in remedial instruction at the University of California, Riverside campus. The course began with twelve grammar and syntax programs previously developed independently of the Riverside program. Courseware was written in APL for the IBM 360-50 with remote terminals. The whole Riverside test was planned and instituted, complete with hardware installation and

software adaptation, between January 3 and April 1, 1972.

The course was organized with a student programmer present every afternoon that the three terminals for this project were free, to help with any technical problems and to monitor the students. The course required one hour of computer time per week, plus a two-hour weekly writing workshop with the instructor. The trial CAI included only grammar and syntax programs, though during the course students requested that punctuation be added.

Because of the time constraints in setting up the program, and because of the small size of the class and the variety of students in it (the class began with fifteen students, ranging from freshman to senior), no control group was set up for comparative purposes, and no pre- and post-tests were given. However, at the conclusion of the course the students stated that the course had been helpful and enjoyable, and the supervisors concluded that the program could fit students with various backgrounds.